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EDITED BY

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S'il est possible de perfectionner l'espèce humaine, c'est dans la médecine qu'il faut en chercher les moyens.

—DESCARTES

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SECONDARY PUERPERAL HEMORRHAGE.

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WHILE the occurrence of more or less alarming uterine hemorrhage immediately after or during the first twelve hours following delivery is by no means uncommon, and while its causation, prevention, and treatment are thoroughly discussed in all the text-books on obstetrics and in the current medical press, the subject of metrorrhagia at a later period of the puerperal state, so-called "secondary hemorrhage," has received comparatively little attention. The majority of obstetric treatises scarcely refer to the possibility that alarming uterine hemorrhage may occur as late as several weeks after confinement, and only the standard works of Barker, Winckel, Playfair, Spiegelberg, and Barnes devote a fair amount of space to this accident. And even these authors, while alluding to individual experience of their own, all refer to the wellnigh exhaustive memoirs of Mc Clintock,[1] of Dublin, published in 1851, and of Bassett,[2] of Birmingham, in 1872. Barker and Playfair both remark that this variety of uterine hemorrhage has not received sufficient notice in the text-books, although, as the latter writer says, it "often gives rise to

[1] Secondary hemorrhage after parturition.—*Dublin Journ. Med. Sc.*, May, 1851.

[2] *Brit. Med. Jour.*, 1872.

serious and even fatal results, and is always somewhat obscure in its etiology and difficult to treat."

As for the medical press, while "post-partum hemorrhage," that is, the primary or immediate variety, seems a favorite theme, and has even excited the most animated, and at times personal discussions in our obstetrical societies, the, if more rare, not less serious secondary variety, is scarcely ever recorded. It was this very fact, no doubt, which some two years ago induced the learned professor of obstetrics at Indianapolis, Dr. Theophilus Parvin, to write an elaborate essay on this subject, which he read before the American Gynecological Society at its meeting in Cincinnati in Sept., 1880, and which is published in vol. v of the Transactions of that Society. Inasmuch as this admirable series is probably mostly read by specialists, and naturally not as familiar to the general profession as it should be, and the Society wishes it were, Dr. Parvin's paper has possibly escaped the notice of many of my readers, as, indeed, I had entirely forgotten its existence (not having been at the meeting where it was read), until after this article was written, when my attention was called to it by a friend. These circumstances and the comparative rarity and gravity of the accident are, in my opinion, a sufficient reason for the report of the following case, which presents, in addition, certain peculiarities of special interest, not referred to by Dr. Parvin.

On Aug. 2, 1882, about noon, I was sent for in great haste by Dr. S. Kohn to see a lady who was said to be in great danger from uterine hemorrhage. On arriving at the house I learned from the doctor the following history: Mrs. C. G., twenty-five years of age, mother of three children, had always been in robust health. Was taken in labor on July 16th with her fourth child. Labor progressed very slowly in spite of severe pains until the head almost rested upon the perineum, completely filling the pelvic cavity. As no advance was made, and labor had already lasted twenty-one

hours, the forceps were applied, but slipped off twice. An hour later, the forceps having again been attempted with the same result, the cranium was opened with scissors, and the forceps were again applied, and again refused to hold. The cephalotribe was then employed, and the head delivered ; the remainder of the child was easily extracted. The cause of the difficulty proved to be hydrocephalus. Hemorrhage was quite profuse, but soon ceased. The placenta was adherent to the right side of the fundus, and required complete separation by the hand. Care was taken to avoid leaving any fragments behind. Two fluid drachms of ergot were administered by the mouth and all hemorrhage ceased. On examination it was found that the anterior lip of the cervix was quite badly torn.

The patient felt well the next day, and appeared to be doing finely for the next six days, although the temperature and pulse kept at 101.5° to 102° and 120 respectively. The lochia were fetid from the third day on ; and the uterine injections washed away numerous small shreds and coagula, until the lochia lost their offensive odor.

On July 28th, however, the eleventh day, the lochia again became offensive, but the odor was different from that noticed at first ; and the discharge was more scanty, serous, with admixture of a reddish-black fluid like that discharged from under a slough in any part of the body. The temperature now reached 103° for one hour, and then fell to 102°, remaining at 101° to 102° night and morning for several days. On the thirteenth day, July 30th, the temperature was 100° in the morning, 101° in the evening. The patient felt quite well, sat up in bed a little every day, and read the paper. Appetite for solid food absent, but milk, soup, and wine taken in fair quantities. The bladder failed to do its duty, and the catheter was required twice daily. Probably it had been bruised during the long labor and delivery. On the sixteenth day, Aug. 2d, at 5 o'clock in the morning, a profuse hemorrhage began, which, when the doctor saw the patient at 9½ o'clock, had almost exsanguinated the patient. Her friends had attached little importance to the flow at that late day, and did not send for him until her weak condition had begun to alarm them. He found her lying in a pool of blood, and immediate interference imperative. The bleeding was arrested for a moment by a hot water intra-uterine injection, but soon recommenced ; was again checked by hot injection and tamponade of the vagina, and I was sent for. When I arrived I found in attendance Drs. S. Kohn, C. A. von

Ramdohr, and J. H. Hillyer. The physician who had confined the lady, Dr. Julius Bopp, was not present.

I found the patient with low head, perfectly pallid ; face, hands, and feet cold and clammy ; pulse 120 and *very* faint ; consciousness unimpaired. She merely complained of feeling very weak. On palpating the abdomen, I felt the fundus on a level with the umbilicus, irregular in outline, the right horn extending several inches above the navel. Moderate tenderness. The tampons protruded from the vulva, and were matted together by a moderate amount of bright-red coagulated blood. There was a somewhat offensive odor about the vulva. In spite of the weak condition of the patient, it seemed advisable to remove the tampons and endeavor to arrest the hemorrhage permanently, which evidently had ceased but temporarily. So long as the uterus was distended by coagula, as at present, no permanent cessation of the bleeding could be expected, and the decomposition of the coagula would but add to the danger by producing septic infection. After preparing fresh carbolized tampons, procuring a few ounces of pure tr. iodine, and a fountain syringe filled with very hot carbolized water, I rapidly removed the tampons, and at once passed my hand into the dilated vagina, and through it into the distended uterine cavity. The latter I found filled with soft coagula, which I speedily removed to the amount of several handfuls. They were exceedingly offensive, dark-colored, and largely mixed with shreds of decidua. After clearing out the uterus, I found its internal surface very soft, pulpy, and the mucous membrane apparently very much thickened. Near the fundus, the finger easily entered the tissue, and the sensation given was exactly as though the opposing surfaces of endometrium had become adherent, and were separated by my finger. I had felt such a condition but once before, in a case of septic endometritis seen in consultation last spring, which terminated fatally. The endometrium was quite smooth, and there was no evidence of retention of placental fragments. Each horn of the uterus was separated from the main cavity by a circular band, the right horn being the larger. After rapidly cleaning out the uterine cavity, wherein caution was necessary in order to avoid injuring, perhaps perforating, the pulpy wall of the organ, I introduced a long metal tube and washed it out with carbolized water from a fountain syringe, the water being as hot as my hand could bear. The patient's sensibilities were so low in her exhausted condition, that she did not complain of the heat. I then introduced a large cylindrical

speculum, through it the tip of a long cervical syringe, and injected half an ounce of pure simple tr. iodine into the uterine cavity, using some force in order to ensure the thorough distribution of the iodine. As it flowed into the speculum I mopped it up with cotton, and then packed the vagina with cotton tampons joined by a cord, and withdrew the speculum. Had the patient not been so weak I should have applied the iodine and the tampons through Sims' speculum, and perhaps have then tamponed the cavity of the uterus itself. But as it was, the tampons were applied merely as a safeguard against further hemorrhage in case the iodine failed to check it, and I directed them to be removed in six hours. The patient's extreme weakness made it imperative that she should under no circumstances lose another drop of blood.

The injection of iodine gave no pain whatever, nor was it followed by shock. But the pulse now became so faint that six hypodermics of brandy were given, and ten drops of aromatic spirits of ammonia, five drops of spirits of camphor, and a teaspoonful of brandy were ordered in ice-water every half-hour. As an additional safeguard against hemorrhage, a hypodermic syringeful of Squibb's fl. extr. ergot. was injected into the subcutaneous cellular tissue of the abdomen, and an ice-bag placed over the uterus. I was so afraid of a return of the hemorrhage, that I preferred to risk the possible depressing effects of the ergot on the patient, even in her weak state, rather than to omit any reasonable precaution against hemorrhage. A bottle of hot water was also placed at the feet.

I then left the patient with directions, after removal of the tampons, to inject the uterine cavity very gently with tepid carbolized water, as a preventive against the decomposition of the iodine coagula.

The next morning I received a telegram informing me that the patient had rallied. On visiting her twenty-four hours after the treatment already described, I found her with a circular flush on each cheek, bright eyes ; pulse, 120 and bounding ; temp. in axilla, 101.5°. There had been no more hemorrhage, although the uterus had been washed out several times.

The doctor informed me that soon after my departure on the previous day the patient went into so profound a collapse that he thought she would not rally ; she also vomited freely. After a few hours, however, she recovered, and he expressed himself as hopeful of her recovery. I told him that I could but repeat my convic-

tion expressed the previous day, that if she rallied from the hemorrhage I did not fear its return, but that I very much apprehended the issue of the septic endometritis from which the patient seemed to be suffering. In this opinion I was confirmed by the hectic flush and the peculiar sweetish odor about the patient. I directed tepid injections of a dilute solution ($\frac{1}{6}$ per cent.) of permanganate of potash into the uterus every three hours, more or less, according to the offensiveness of the discharge; further, salicylate of soda in capsules, 10 grains every two hours, if borne by the stomach, in case the temperature should rise above 102°. Otherwise, stimulants *ad lib.* My prognosis was unfavorable.

As I was attending a case of confinement, I begged to be excused from further charge of the case, merely signifying my willingness to be of assistance at any future time if wanted. The remainder of the history I owe to the kindness of the attending physician, Dr. Kohn.

Beginning immediately after the permanent arrest of the hemorrhage, every means was employed to replace the blood lost, and enemata of meat extract, brandy, and warm salt water were given hourly, as well as frequent hypodermics of brandy. The stomach could retain nothing, even iced champagne being rejected. At 3.15 P.M., temp., 101°; at 10.30 P.M., 105°; pulse, 132. Reaction had now taken place.

Carbolized intra-uterine injections were employed every three hours.

Aug. 4th—Temp., 7.30 A.M., 101.3°; 10.30 A.M., 102.3°; 4.30 P.M., 103.4°.

Aug. 5th—Intra-uterine injections with sulphate of quinine.

Morning—Temp., 101.3°. Evening—Temp., 102.5°.

Aug. 6th—3.30 A.M., 102°; 7.30 A.M., 100.5°; 9 A.M., 100.1°; 12 M., 101.1°; 8 P.M., 102.1°. Pulse, 114.

Nourishment and brandy taken in good quantity. Sensorium clear. Bowels moved twice after enema. Since yesterday lochia have changed from their putrid to a more natural odor, and appear merely purulent.

A circumscribed swelling is also noticeable to the left of the umbilicus, which Dr. Bopp believes to be an exudation into the broad ligament. An ice-bag was applied. Dr. Kohn thinks this may be an effort of nature to check the disintegrating process going on within the uterus.

Aug. 6th—10 P.M. Patient sleeping quietly after an intra-uterine irrigation and an egg-nogg.

Aug. 8th—Temp., 100° ; pulse, 100 to 110. Lochia profuse and purulent: swelling in left side disappearing. General depression and hectic facies have given way to a feeling of comfort and contentment. Uterus syringed several times daily with a solution of sulph. quinine, ʒ i to the quart.

The patient made a very slow recovery, it being fully five weeks after the hemorrhage, as the doctor informed me, before complete convalescence was established. Only the most unremitting care and constant irrigation of the uterus with sol. potass. permang., with stimulants and tonics, finally succeeded in saving the patient's life. The offensive lochia continued for several weeks after the hemorrhage.

There are several points of interest in this case which I will review in detail.

1. *The cause of the hemorrhage.*—The conditions which may produce secondary uterine hemorrhage are enumerated by Barker and Playfair as follows: *Constitutional:* Hemophilia; mental emotion; functional disease of liver (?); incautious use of stimulants; sudden assumption of the erect position. *Local:* Irregular and inefficient contraction of the uterus; clots in the uterine cavity; portions of retained placenta or membranes; retroflexion of the uterus; laceration of the vagina or vulva; laceration or erosion of the cervix; ("inflammatory ulceration of cervix" Bennet); malignant disease of cervix; pelvic cellulitis; inversion of the uterus; premature sexual intercourse; loaded rectum.

To these I would add one cause which these two authorities do not mention, but which Winckel speaks of, and which I have repeatedly seen as the reason for secondary internal hemorrhage during the first forty-eight hours after labor, namely the distended urinary bladder. Uterine contraction is interfered with by the enlarged bladder, the uterine cavity fills with blood, and the fundus is found pushed to one side and even as high as midway between umbilicus and diaphragm. A case is mentioned by Winckel in which a similar result was produced by a recently de-

veloped ovarian cyst, which dragged the uterus up and interfered with its contraction. Profuse hemorrhage occurred on the third day.

Forcible straining during defecation may also dislodge newly formed thrombi at the placental site. And four cases are mentioned by Winckel in which secondary hemorrhage occurred during a chill. It is quite plausible that the form of malarial infection known as a "congestive chill" may, by the powerful determination of blood to the internal organs, produce a uterine hemorrhage even at a late day after confinement. Indeed, Playfair cites Saboia as authority that in Brazil secondary puerperal hemorrhage is a common symptom of malarial poisoning, and can only be cured by change of air and the free use of quinine. And Barker, in his well-known paper on "Puerperal Malarial Fever,"[1] reports five cases in which secondary hemorrhage appeared after the twelfth day, apparently as the result of malarial fever; in two cases the hemorrhage was alarming. Hanks also reports a case of serious secondary hemorrhage from the same cause.[2]

General febrile disturbances (exanthemata, typhoid fever, rheumatism, pneumonia, etc.) occurring during childbed, may, by means of the greater circulatory activity existing at such times, also cause secondary metrorrhagia.

A cause upon which great stress is laid by Winckel is too early getting up; at least sixteen per cent. of the lying-in women under his care lost blood (in small amount, of course) on the ninth day soon after leaving their beds for the first time. Still another cause, in which I am particularly interested in this instance, is also spoken of by Winckel, and, so far as I can find, by him alone, and that is, *diseases of the inner surface of the uterus*, chiefly endometritis. This, Winckel says, is one of the rarer causes of secondary hemor-

[1] *Am. Jour. Obst.*, April, 1880. [2] *Am. Jour. Obst.*, Jan., 1880.

rhage, which may be due either to the congestion of the endometrium, or (especially in the diphtheritic form) to erosion of the already occluded vessels of the placental site, by sloughing, I presume.

When I was asked by the gentleman first attending the present case, what I thought to be the origin of the hemorrhage, I replied that the patient seemed to me to be unquestionably suffering from septic endometritis, with a decided hyperplasia of the endometrium, a species of fungoid proliferation; the constant rise of temperature during the week preceding the hemorrhage, with the offensive lochia, seemed to speak for this assumption. The bleeding I believed to be due to a superficial sloughing of more or less of the surface of the hyperplastic endometrium. At that time I was not aware that puerperal endometritis is cited as one of the causes of secondary hemorrhage. I now think it quite possible that a deeper slough, probably at the placental site, took place, and that the newly formed thrombi were dislodged. This supposition seems more plausible than that of a universal oozing, since Spiegelberg says that septic endometritis, by its obliteration of the superficial vessels, prevents secondary hemorrhage. I presume we have all seen the newly formed decidua in post-mortems from septic endometritis changed into a pulpy, fibrinous mass.

Of course this view of mine could have been confirmed only by an autopsy; but I can positively assert that no fragment of placenta remained in the uterus, that no deep fissure in the uterine wall existed, and that the endometrium was perfectly smooth. If I am correct, we must consider secondary hemorrhage a possible additional danger to be apprehended from, and guarded against in, puerperal septic endometritis, a disease surely quite serious enough by itself.

2. *The date of the hemorrhage after delivery.*—The time at which secondary hemorrhage is liable to occur varies

greatly in accordance with the character of the labor, the care taken of the third stage, the precautions employed during childbed, and accidental circumstances. As a rule, it may be assumed that the more thoroughly and carefully the contraction of the uterus has been assured after delivery of the placenta and its relaxation guarded against for some hours at least, the less likely is early secondary hemorrhage, that is, within the first forty-eight hours, to occur. In institutions where stringent rules exist as to the supervision of the uterus after delivery and the firm contraction of the organ is insisted upon before the attendant leaves the patient, it is a rare thing to find the uterus distended with blood after the first twelve hours have elapsed. Thus, Winckel cites but three cases out of fifty in which the hemorrhage occurred during the first three days after delivery. The same proportion will be found in the practices of those physicians who follow the rules referred to, chief among which are the maintenance of firm contraction of the uterus by gentle friction of the abdomen for at least half an hour after the expression of the placenta, and the administration of ergot (generally one drachm of the fl. extr. suffices) immediately after the birth of the child. If these rules are neglected, and chiefly if friction is not kept up long enough until permanent contraction is assured, in a few hours the uterus again relaxes, blood oozes from the placento-uterine sinuses, and at the next visit the physician finds himself obliged to express a coagulum of greater or less size, if nature's provision, the after-pains, has not forestalled him. In a recent case which I saw in consultation for an extensive laceration of the perineum, about forty hours after delivery, I found a full bladder and a uterus distended by a dark, soft coagulum of about the size of a fist.

Between the third and tenth days Winckel found eighteen cases of hemorrhage, for the most part of moderate degree.

This frequency must partly be attributed to the exertion of getting up, since most of the women left their beds on the tenth day. Of the whole fifty cases, in twenty-six the hemorrhage occurred after the tenth day. This last proportion is unusually large, and I am at a loss to account for it, since Winckel omits to give particulars of these cases. As a rule, hemorrhage occurring or continuing after the woman leaves her bed is due to retention of some small fragment of placenta (chiefly after abortion), or to deficient involution of the uterus, or occasionally to sloughing of the endometrium. I have already stated that, in my opinion, the hemorrhage in the present case was due to the last-mentioned cause. Bassett[1] mentions four cases in which the bleeding was due to retention of portions of the placenta or membranes, and came on on the tenth, twelfth, fourteenth, and thirty-second days; Barker refers to instances as late as the fifth or sixth week after delivery, and Helfer speaks of one during the fourth week. The oozing which is so frequently found as a consequence of subinvolution and deficient contraction of the uterus, especially after abortion, and after normal labors in flabby, atonic, anæmic women, may last for months, and only ceases after general tonic and astringent local treatment. In these cases the return of the first menstrual epoch is frequently marked by an unusually profuse flow.

Laceration of the cervix during the recent labor exerts an unquestionable influence in prolonging the oozing from the uterus, both by means of interference with involution and through direct hemorrhage from the rent itself.

3. *The diagnosis of secondary uterine hemorrhage* need be mentioned only to point out that in the early cases the outlines of the uterus should always be clearly defined, since the hemorrhage may be wholly internal and be suspected only by the pallor or collapse of the patient. At a later

[1] *British Med. Jour.*, 1872.

date, when the uterine cavity is smaller, the discharge of blood from the vagina of course reveals the nature of the case. The cause of the hemorrhage, however, may not be so easily ascertained, especially in the later cases, when it may be necessary to dilate the uterine cavity by tents or rubber tubes in order to make the diagnosis by introduction of the finger.

4. *The significance of secondary hemorrhage* depends partly upon the amount of blood lost and escaping, and partly on the origin of the flow. The sooner the patient is seen and the flow controlled, of course, the less dangerous the case. Hemorrhage depending on mere temporary atony of the uterus, which can ordinarily be checked at once by friction, compression, and styptics, is evidently less serious than if due to sloughing of the placento-uterine thrombi or bursting of an ectatic vein. While Spiegelberg, who speaks of having seen one serious case of hemorrhage on the fourth day from simple atony of the uterus, and a number of other severe hemorrhages from retention of portions of the secundines, did not lose a case, Bassett had two deaths out of thirteen cases, and McClintock collected six fatal cases. Mme. La Chapelle mentions a case of death on the eighth day from internal hemorrhage and retention of the clot. Barker relates an instance of almost fatal hemorrhage on the second day from mental emotion, and McClintock one on the twelfth day from taking a dose of brandy while sitting up the first time, and another on the eighth day from mental excitement. In my case there can be no doubt that even a very slight additional hemorrhage would have proved fatal. The occurrence of serious or fatal hemorrhage at a later date than the fourteenth day after delivery is certainly very rare. The chief evil consequences of protracted secondary hemorrhage, *metrorrhagia lochialis*

as Breisky[1] calls it, is the debilitating effect on the woman and subsequent uterine disease of some form or other.

5. *The means employed to check the hemorrhage.*—The injection of pure tincture of iodine into the uterine cavity as a hemostatic after delivery has been recommended by Dupierris and Lente and practised by many others in occasional cases; the excellent effects of the agent in non-puerperal hemorrhage have been warmly praised by Thomas Addis Emmet, whose example has been followed by many of us. I am not aware that iodine has been used as an injection in secondary hemorrhage, but there is no reason why its styptic effects should be less pronounced then than immediately after delivery. Besides, it is an excellent disinfectant, which was of importance in the present case. It does not form hard coagula, as does the tr. of perchloride of iron, which coagula are liable to decompose and give rise to septic infection, or by their presence excite fresh hemorrhage. I might, it is true, have employed the mixture in equal parts of the tr. ferri perchloridi or persulphatis and glycerine, according to the practice of Dr. H. P. C. Wilson, whereby the formation of coagula does not take place. And had the hemorrhage returned, I should undoubtedly have employed this formula. As it happened, the iodine first occurred to me and proved effectual.

The method of injecting the iodine through a cylindrical speculum is to be recommended as a means of saving the vagina and vulva from the unavoidable contact with the fluid if the latter is simply injected into the uterus under guidance of the finger. In the present case, finding that I could not pass the nozzle of the syringe quite to the fundus through the speculum, I first inserted the syringe and then passed the speculum over it.

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[1] Breisky: Treatment of puerperal hemorrhage, *Volkmann's Klin. Vorträge*, No. 14, 1871, p. 108.

As regards the application of a tampon after labor, I need scarcely say that it should never be done unless the uterus is so contracted and constantly watched that no internal hemorrhage can take place. In the present instance doubtless the tampon which I removed had caused the accumulation of blood in, and the distention of, the uterus ; but it had arrested the external hemorrhage, which was far more severe than the internal bleeding was likely to be. Besides, at so late a period as sixteen days after delivery the attending physicians were to a great extent justified in not looking for so easy a distensibility of the uterus. I reapplied the tampon temporarily as a possible safeguard against external hemorrhage until the patient had had time to rally a little, and with the positive understanding that the fundus uteri should be carefully watched until the tampon was removed.

The hypodermic of ergot was administered more for its specific hemostatic effect, than with any idea of contracting the uterine muscle, which in its inflamed, pulpy condition seemed incapable of healthy contraction. In the collapsed condition of the patient this agent might possibly have been omitted. Still it did no injury.

It is possible that the hot water injection might have been sufficient to check the bleeding. I thought, however, that it was best to take no chances, but to do the work thoroughly.

As a rule, it may be assumed that the same remedies and measures which are used to check primary uterine hemorrhage will be effectual in the secondary variety. Even when the hemorrhage occurs at a late date after delivery, the agents which act chiefly by contracting the uterine muscle, as ergot, viscum album, fl. ext. gossypium, ustilago maidis, etc., will prove useful, as well as the general styptics, like sulphuric acid, cannabis indica, matico, etc. In cases where the hemorrhage depends on pelvic congestion, saline laxa-

tives combined with or followed by ergot and sulphate of iron will be serviceable.

In the earlier periods after delivery the clearing out of clots from the uterine cavity with the hand, and the excitation of the organ to contraction by external and internal friction, then, if still necessary, the intra-uterine injection of styptics, will be indicated. At a later date, when the uterus has already undergone a certain degree of involution and the cavity is small, the repeated introduction of astringents into it on cotton cones slipped off from applicators, and the firm columnar tamponade of the vagina with flat discs through Sims' speculum may be required. The latter are more usually cases of protracted bloody lochial discharge or of constant sanguineous oozing due to subinvolution. The eventual closure of a cervical rent will become imperative after a lapse of at least two months after delivery, if the flow seems to depend on this injury. By the introduction of pure tr. iodine into the uterine cavity on cotton-wrapped applicators, which are immediately withdrawn, about twice a week for several weeks or months I have in a number of instances achieved a complete cessation of the bloody oozing, a return to regular menstruation if the patient chanced not to be nursing, and a complete involution of the uterus. It has not been my intention to go over the whole ground of secondary puerperal hemorrhage, or to take up separately each of the etiological factors enumerated in the early part of this paper. For a discussion of these, I will refer to the works of Barker, Winckel, and Playfair, or to the original memoir of McClintock, to which, Playfair says: "We owe almost all our knowledge of this condition"; and to the paper by Parvin. I merely desire to add another case to the comparatively few on record, and by pointing out some of its peculiar features, perhaps draw out the experience or opinion of the profession.

Before concluding, I wish to say a word as to the prevention of these hemorrhages, primary and secondary. Assuming a firm, permanent contraction of the uterus after delivery to be a cardinal principle for the prevention of post-partum hemorrhage, the following brief rules may be laid down for the management of the third stage of labor, and the early puerperal state:

1. Always keep the supporting and compressing hand on the fundus uteri from the moment the head appears at the vulva until the placenta is expelled.

2. Do not hasten the expulsion of the placenta too much, but by steady, gentle friction of the fundus endeavor to obtain its total spontaneous detachment, the occurrence of which can easily be detected by the uniform firm outline of the contracted uterus on palpation.

3. Always watch the uterus with the hand, using gentle friction for at least an hour, at intervals, before leaving the patient.

4. Always give ergot (one drachm or more of the fl. extr.) by the mouth immediately after the birth of the child. If chloroform has been given for an operation, or if the labor has been unusually tedious, give the ergot hypodermically, injecting a syringeful of the fl. extract to the depth of one inch, near the umbilicus. It is always advisable to have the syringe filled with ergot, and to see that it is in good working order, before the conclusion of the labor.

5. Always have ice on hand; and if the uterus shows a reluctance to remain contracted, rub the fundus gently with a piece of ice, or insert a cone-shaped piece into the cavity. (As a rule, the injection of *hot* water, while a powerful styptic, is less agreeable to the patient at this time, and will scarcely be employed unless actual hemorrhage occurs.)

6. Always make sure by palpation and compression that the uterus contains no coagula, and if such still form at once express them.

7. Aid in securing permanent contraction of the uterus by an early application of the child to the breasts.

8. If the labor has been tedious or instrumental, or the uterus contracts badly, or the patient is not to nurse the child, or is constitutionally feeble, it is wise to guard against subinvolution and a long continuance of the bloody lochia, by giving the patient a pill containing one or two grains of Squibb's aqueous extr. of ergot, two grains of quinine, and one third of a grain of extract of nux vomica, three times a day for ten days or two weeks, or longer, beginning on the day after delivery. If the stomach is irritable this combination may be given in rectal suppositories, the quantity of ergot being doubled.

9. Before leaving the patient, an equably tight binder should be applied, and if there be tendency to hemorrhage, a pad should be placed under the binder over the fundus, to secure its steady compression.

10. Examine the cervix and vagina with the finger immediately after delivery, and if there be a laceration of either, be prepared to check possible future oozing by mild astringent injections, or, if need be, applications through the speculum. (Immediate suture, as recommended by some, appears to me rarely feasible, under the conditions as to light, assistants, hemorrhage, etc., usually accompanying childbirth.)

11. Do not allow a lying-in woman to make rapid motions in bed, strain, sit up suddenly or very long, or to leave her bed before the tenth day.

12. Keep watch of the bladder, particularly during the first twenty-four hours, and assure yourself by palpation and percussion that it is empty and is not interfering with uterine contraction.

13. Instruct the nurse not to insert the nozzle of the syringe too far, or to use too much force in giving the cus-

tomary cleansing injections, for fear that the cervix may be bruised.

These rules might be extended, but I am confident that if those here given are carefully observed, primary hemorrhage will be greatly diminished in frequency, and secondary bleeding, particularly of the atonic and subinvolution type, will rarely be met with. Those cases in which accidental causes are at fault, will, of course, be as little under our control as heretofore.

THE LETHAL TRACE: A STUDY IN SPHYGMOGRAPHY.

By R. W. AMIDON, A.M., M.D.

IS there a pulse indicative of impending dissolution? If so, what are its characteristics? There was a time when the pulse was held to be the most valuable aid in the diagnosis of disease, and when a certain variety of pulse was considered pathognomonic of a certain disease. In later years, while perhaps the pulse has lost some of its pre-eminence as a vital sign, and we have learned to see in its changes not diseases but pathological conditions, still, by means of our apparatus to make it visible, the pulse teaches us much more than it did physicians twenty years ago. No person with the most delicate touch can detect such minute changes in the pulse as are readily demonstrated by the sphygmograph.

In answer to the question, we would say that there is a pulse occurring in acute disease which would confirm the gravest prognosis, and which, when transferred to paper, may well be called the lethal trace.

The pulse, according to the old nomenclature, would be called the "pulsus celer et mollis," or the so-called "gaseous pulse." In more modern times it would be described as a "quick, monocrotic" pulse, entirely wanting in "tension."

The normal human pulse is dicrotic.[1] The first beat is

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[1] *Δίκροτος:* double beating.

produced by the filling of the artery by the ventricular contraction (perceptible to the finger), the second by a rebound of the arterial contents from the aortic valves and sinuses (smaller than the first, and rarely perceptible to the finger). After this the artery falls away under the finger, owing to the emptying of its contents into the capillary system.

Made graphic, we thus have a sudden ascent, followed by a gradual fall to the base line, the line of descent being broken at its upper third by a slight rebound. Such is the tracing of a pulse in health. It indicates a strong heart, an elastic artery, sufficient aortic valves, and an amount of resistance in the capillary circulation, a tonus, on which glandular activity and a proper maintenance of all the vital phenomena depend (trace 1, fig. 1).

When acute disease, especially an acute febrile disease, attacks a *healthy* person, the first weakness manifested is generally a failing tonicity of the arterioles and capillary vessels, producing a fall in arterial tension. This is felt in the pulse by its quick collapse, and is shown in the trace by the abruptness of the down-stroke (trace 2, fig. 1).

The heart is still intact, hence the pulse is full, and the up-stroke in the trace has the proper direction and amplitude, and the artery, still retaining its elasticity, has its dicrotism (trace 2, fig. 1).

As the disease progresses the capillaries become more and more patent, and what is known as complete dicrotism may occur (trace 3, fig. 1). The condition then is a heart still strong, capillaries relaxed, but arteries still resistant. Here we would have a quick, vanishing pulse, and in some instances a dicrotic beat distinguishable to the finger. The quick egress of blood, mostly through the capillaries, produces in the tracing a sudden and complete down-stroke—one that reaches the base line. Not all the blood, however, is sent peripherally; some is forced back on the aorta, and,

by its recoil, again partly fills the collapsed artery, producing the dicrotic wave (trace 3, fig. 1). Further on in the disease the weakness, which has from the first fallen on the capillaries, begins to creep back, up the arterial twigs, paralyzing larger and larger vessels. The recoil becomes less and less as the arteries become relaxed and inelastic, and hence the dicrotism gradually disappears (traces 4, 5, 7, fig. 1).

When this paralysis reaches the great vessels and aorta no rebound takes place, dicrotism disappears and we have a monocrotic pulse—which gives the lethal trace (traces 8 and 9). What have we here? A still strong heart pumping blood into a relaxed, inelastic tube, which divides into smaller tubes, which are also relaxed and inelastic. No impediment to the onflow of the blood occurs, hence we have the same effect as would be obtained by pumping blood into inelastic tubes with open ends (trace 6, fig. 1). As we said before, a certain amount of arterial tension and elasticity is necessary for the proper regulation of secretion and excretion. What occurs when complete arterial relaxation takes place, is this: The blood little by little accumulates in the venous system, congestion of the various viscera,—kidneys, lungs, and brain—takes place, which, in the case of the lungs, precipitates an œdema, which generally carries off the patient. The heart generally continues to beat, and death takes place from apnœa.

To briefly recapitulate, then, we may fairly conclude that a pulse, at first dicrotic, which gradually loses its dicrotism and becomes quick and monocrotic, is indicative of pathological changes from which induced or spontaneous recovery is extremely doubtful, warrants a bad prognosis, and, when transferred to paper, may well be called the lethal trace. In its development, the failure of the arterial elasticity is of the gravest import. The arterial tension may almost disappear, as it does in typhoid fever, etc. (trace 3),

and still the prognosis remain good and recovery take place; but where the arterial trunks lose their contractility, even though the heart remain strong, the vital power has reached so low an ebb that reaction cannot ensue.

An attempt to simulate the lethal pulse by forcing air through an inelastic tube is given in trace 6, fig, 1.

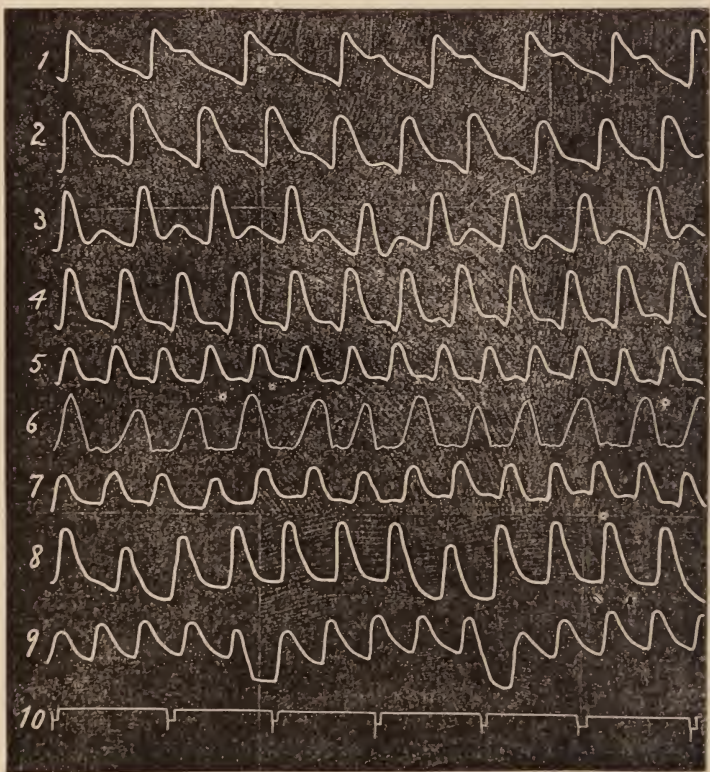

FIG. 1.—TRACES OF THE RADIAL PULSE.

1. Normal; pulse, 72. 2. First week of traumatic erysipelas; pulse, 99. 3, First week of typhoid fever; pulse, 90. 4. Traumatic tetanus, ten hours before death; pulse, 117. 5. Same, two hours before death; pulse, 145. 6. Trace taken on the schema to imitate the lethal trace; pulse, 108. 7. From case of traumatic erysipelas (No. 3), taken on day of death; pulse, 145. 8. Case of acute pneumonia, day of death; pulse, 117. 9. Case of meningeal hemorrhage and œdema of lungs, just before death; pulse, 145. 10. Trace of chronograph marking seconds.

Let not the reader conclude from what has been said that a pulse similar to the one just described, is invariably followed by fatal results. In the collapsed stage which follows the pyrexia in a severe malarial paroxysm, a pulse as devoid of tension and dicrotism is seen as that which produced trace 4, fig, 1. In some cases of cerebral concussion the same is seen.

At the commencement of this note, the statement was made that in *acute* disease, the pulse was of especial prognostic value. Why not in chronic diseases? In the first place, in chronic diseases, especially when accompanied by profound asthenia, the heart is apt to become so weak that the radial pulse is insignificant to the finger, and on paper produces traces of such small dimensions that an accurate study of their features is almost impossible. The sphygmograph reveals, in these filiform pulses, what the most skilled "tactus eruditus" cannot, as the accompanying traces will show.

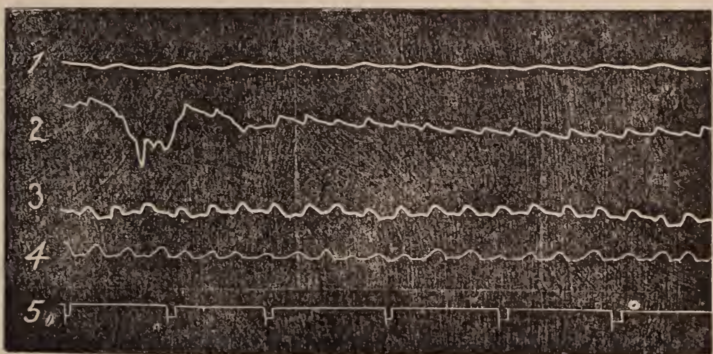

FIG. 2.—RADIAL TRACES.

1. In a case of chronic phthisis almost moribund. (Pulse, 120.) 2. In a case of chronic pleurisy, with purulent effusion, terminating fatally. [Pulse, 240 (?).] 3. In a case of acute pyæmia on day of death (a weak *lethal* trace). (Pulse, 204.) 4. An imitation of a weak lethal trace on the schema. (Pulse, 216.) 5. Second marks.

Of these traces, the first and second show a very weak, almost fluttering, heart, but some remains of blood-pressure

and arterial tonus. Now, we know that many of these pulses, in patients apparently dying of asthenia in chronic disease, or from sudden collapse, will fill up wonderfully under appropriate restorative treatment.. The third trace, however, lacking both heart-power and arterial tonus, is certainly indicative of excessive prostration.

One caution it would be well for the reader to bear in mind, that is, that a person suffering from aortic insufficiency would, perhaps, on quite slight prostration, from acute or chronic disease, develop a pulse very similar to our lethal pulse.[1] One other caution is that the pulse of some of the distant, peripheral arteries, as that of the dorsalis pedis, is often monocrotic, especially if atheroma be present.

Many examples of what has here been described and depicted as the lethal trace, have been published,[2] but no special attention has been drawn to their significance.

The cases from which traces 8 and 9 (which are typical), were taken, will be briefly narrated.

CASE I.—*Croupous pneumonia and abortion.* Mrs. R., æt. thirty-three, pregnant six months, was admitted to the New York Hospital August 16, 1878, service of Dr. Woolsey Johnson.

Aug. 13 she had been immersed in the water nearly an hour, and was taken out in an exhausted condition. That evening she had a chill, nausea, and bloody expectoration, followed by pain in the side and great dyspnœa.

On admission there was found consolidation of the upper lobe of the right lung and œdema of all the non-implicated lung tissue.

T., 39.5° ; pulse, 160 ; R., 40. At this time the pulse gave a tracing similar to trace 5, fig. I.

The next morning the vital signs were T., 37.7° ; P., 108 ; R., 32, at 6 o'clock.

About 9 A. M. trace 8, fig. I was taken, which shows the respira-

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[1] *See* "Études de Médecine Clinique," etc. "Le Pouls." P. Lorain, Paris, 1870, p. 264, *et seq.* *Also*, "La Circulation du Sang," etc. E. J. Marey, Paris, 1881, p. 678, *et seq.*

[2] Lorain, pp. 220, 245, etc. Marey, pp. 571, 2, etc.

tory curve ; the fall in the trace indicating inspiration, the rise expiration. The œdema of the lungs continued. About seven in the evening abortion, accompanied by little hemorrhage, took place. About eight the next morning death ensued, the temperature in the rectum at the time being 43.8°. On autopsy, eight hours after death, besides the pulmonary lesions, there were found excessive congestion of liver and kidneys, and an enlarged heart.

Case 2.—March 25, 1878, Mrs. H., æt. seventy-five, was admitted to the New York Hospital, service of Dr. W. H Draper. The patient was of an apoplectic family, but with the exception of an occasional dizziness, she had good health. At four o'clock on the afternoon of admission the patient was found unconscious. On admission at 6 p. m. the patient was in a state of complete coma, and had been, and was still, vomiting ; there were divergent strabismus, contraction of the right pupil, reflex movements on the right side only, hot and dry skin, and stertorous respiration. Contraction of the right pupil prevented a view of the fundus, but examination of the left eye revealed two large, bright red retinal hemorrhages. The patient died about noon on the second day. On autopsy, there was found an aneurism of the middle cerebral artery, which, by rupturing, had covered the entire left hemisphere with blood, and lacerated the tip of the left temporo-sphenoidal lobe. There were hemorrhagic infarctions in both lungs, atheromatous deposits in the cardiac valves and aorta, slightly fatty liver, and atrophic kidneys, hemorrhage in the retina of the left eye and into the sheath of both optic nerves.

THE PHYSIOLOGICAL ACTION OF CONVALLARIA MAIALIS (LILY OF THE VALLEY).

By ISAAC OTT, M.D.

THIS drug, long known as a cardiac poison, has lately been put forward as a remedy of considerable value in heart disease and dropsies. Its reputation in dropsy has been partially made by the peasants of Russia. Walz, in 1830, isolated two glucosides convallamarin and convallarin. Under the influence of acids convallamarin splits up into convallameretin and sugar, whilst convallarin becomes convallaretin and sugar. Experiments seem to show that the activity resides in convallamarin and maialine. Marme has made some experiments with the active principles. Convallarin acts as a purgative on animals, whilst convallamarin, in small doses, is an emetic, and acts like digitaline in causing arrest of the heart in systole. The heart at the time of arrest is not electrically irritable. The cardiac arrest takes place with or without division of the pneumogastrics. The arterial tension does not sink during the slowing of the heart, and increases greatly during the acceleration. The respiration during the decrease of the cardiac frequency is mainly accelerated. Having been requested by my friend, Dr. Amidon, to make some experiments with this drug, I studied its action on the heart of cold- and warm-blooded animals. An ounce of the fluid extract of the root of the drug was taken, and to it was added an ounce of water; the

whole was evaporated to half an ounce at the temperature of 175° F. This I shall denominate an infusion.

Experiment 1.—A rabbit received subcutaneously within fifteen minutes ninety-six drops of the fld. ext. of conval. It was soon noticed that the animal sank down on its abdomen; the saliva flowed from the mouth; twitching of the muscles, especially of the neck; heart beating very slowly and irregularly; breathing irregular.

Within the second period of fifteen minutes, that is, half an hour after the first injection, death ensued; heart arrested in systole, the right auricle still beating. After death the heart contracted to one half its original size.

Experiment 2.—Frog.

			HEART-BEATS PER MINUTE.
2.	P.M.		30
2. 2	"	Eight drops of the infus. conval. subcutaneously.	
2. 5	"		39
2. 7	"	Clonic spasm.	
2.10	"		36
2.12	"		12
2.16	"	Whole heart arrested.	

Experiment 3.—Frog.

			HEART-BEATS PER MINUTE.
2.30	P.M.		48
2.32	"	Eight drops of infus. conval. subcutaneously.	
2.34	"	Ventricle of heart—one half contracting slower than the other half, causing a twisting of the ventricle.	48
2.36	"		24
2.37	"	Ventricle is arrested.	
2.40	"	Sinus and auricle making a few imperfect beats.	

These experiments are sufficient to demonstrate that convallaria causes an arrest of the heart, being preceded in the beginning by a temporary acceleration. After death the heart contracts on itself, till in the case of the frog it has a glistening whiteness. To determine more accurately the cardiac changes, experiments were made on rabbits with the aid of Ludwig's kymographion.

Experiment 4.—Rabbit. Carotid and jugular prepared.

TIME.		PULSE.	PRESSURE.
2.25. 0 P.M.		66	86
	Nine minims of infus. convall. by the jugular.		
2.25. 15 "		71	104
2.25. 30 "		60	140
2.25. 45 "		65	164
2.26. 0 "		65	160
2.26. 15 "		52	164
2.27. 0 "		51	180 spasm.
2.27. 15 "		44	120
2.27. 30 "		—	130
2.27. 45 "		death.	

As is seen in the above experiment, convallaria increases both arterial tension and cardiac frequency, the former rising very greatly. These are both succeeded by a fall below normal. To determine if the fall was due to cardio-inhibitory excitation was the object of the next experiment. Atropin was given before the introduction of the convallaria.

Experiment 5.—Rabbit, vagi paralyzed by atropin.

TIME.		PULSE.	PRESSURE.
1.20. 0 P.M.	Five drops of infus. of conval. by the jugular toward the heart.	67	140
1.20. 15 "		68	160
1.20. 45 "		72	180
1.21. 0 "		61	198
1.21. 15 "		62	180

TIME.	PULSE.	PRESSURE.
1.21. 30 P.M.	62	198
1.21. 45 "	68	184
1.22. 30 "	52	190
1.22. 45 "	41	190
1.23. 0 "	30	150
1.23. 15 "	23	94
1.23. 30 "	12	70
1.24. 0 "	Death.	

It is quite evident that convallaria reduces the cardiac frequency, not by excitation of the inhibitory ganglia of the heart, but by an action on some other portion of the heart, probably the muscle.

Experiment 6.—Rabbit, cord cut between the atlas and occiput; vagi, depressors, and sympathetici divided in the neck; artificial respiration kept up; carotid and jugular prepared.

TIME.		PULSE.	PRESSURE.
2.30. 0 P.M.	Five drops of infus. conval. by the jugular.	25	30
2.30. 15 "		68	160
2.30. 30 "		25	40
2.31. 15 "		18	66
2.31. 30 "		12	90
2.31. 45 "		24	70
2.32. 0 "		22	70
2.33. 0 "		0 Death.	4

That the rise of arterial tension is not wholly due to a stimulation of the main vaso-motor centre is shown by the above experiment. Here the increase of tension is due to one of three causes: the spinal vaso-motor centres, or the peripheral vaso-motor system, or the heart itself, are driven into unwonted activity. The great rise is hardly due to any stimulation of the heart, for the isolated heart of the frog or terrapin causes no marked increase of muscular force when drugged with convallaria. To differentiate between

the spinal vaso-motor centres and the peripheral vaso-motor system no experiments were made.

These experiments demonstrate:

1. That convallaria increases the arterial tension greatly at the same time as the heart begins to beat more frequently; that the heart begins to fall before the tension.

2. The decrease of cardiac frequency is not due to cardio-inhibitory excitation, but to an action on the heart itself, probably its muscular structure.

3. The rise of arterial tension is mainly due to stimulation of other vaso-motor apparatus than the main monarchical vaso-motor centre.

4. The drug causes clonic spasms.

If we compare the action of this drug with digitalis, it is found that the slowing of each is due to different causes: with digitalis it is due to a cardio-inhibitory excitation; with convallaria some other part of the heart is the agent. Digitalis, as a rule, does not primarily accelerate the heart; convallaria does. After section of the spinal cord digitalis is powerless to increase arterial tension, whilst convallaria does. If now we compare the action of this drug with other cardiac agents, as aconite, urechites suberecta, or astragalus mollisimus, it is found that it does not belong to this group. As aconite, urechites, and astragalus resemble each other in their action, yet many important differences exist, so does convallaria differ from digitalis in several important particulars. The great rise of arterial tension would indicate its value in dropsies, reasoning upon Ludwig's theory of renal secretion. It is a drug which must not be pushed to any great extent, if I am to judge from a rather extensive experience with cardiac agents upon the hearts of the lower animals.

THE CONNECTION OF THE LOWER ORGANISMS WITH INFECTIOUS DISEASES.

By Dr. W. T. COUNCILMAN,
BALTIMORE, MD.

WHEN we study the class of diseases known as infectious, we find that they all seem to owe their origin to the entry of an infecting substance, a *materies morbi*, into the organism. These pathogenic agents can be transferred from one organism to the other without losing their power of action; in some diseases this being brought about by contact of the two organisms, in others various objects usually serve as carriers. Now that these agents may have the power of being transferred from place to place on any inert material, it is necessary to assume that they are substances, for we can hardly conceive of a force or any thing like a spiritual emanation being carried in a blanket from a small-pox patient to a well man 1,000 miles away, and there developing itself. Furthermore, these agents have the power of increasing, this fact being proven by the history of all epidemics, for having one case of small-pox, enough material would be produced to infect a community. The idea that these substances were animal organisms, the doctrine of a *contagium animatum*, is nearly as old as the history of medicine, but it was not until the seventeenth century that it took any definite shape. Bianchi, Athenasius, Kirchner, Paulini, and other writers at that time held such views;

still all objective proof was wanting, and it was not until the following century that this was supposed to be had in the presence of the ordinary intestinal worms which were held to be the cause of nearly all the ills that flesh is heir to. Even John Hunter and Adams believed the carcinoma to be caused by an entozoön, and supposed the pain suffered was due to the movements of the animal. The discovery of the yeast cell and the proof that this was the cause of fermentation lent a great impetus to the *contagium animatum* theory, and it has become more and more impressed on the minds of both the profession and the laity. Assuming that the contagia were substances and had the power of increase, an assumption in which we are perfectly justified, the proof that they were living seems, on pure theoretical reasoning, to depend on whether or not they are soluble. A soluble substance, in a purely chemical manner, can produce its like, can increase, but for a granule to multiply it is necessary that it divide, and this process of division must be accompanied by growth of the divided pieces.

Chaveau was the first to bring forward the proof that these agents were insoluble, using for his experiments vaccine lymph. He first showed that the lymph corpuscles which were suspended in this fluid were not the active agents, for after mixing the lymph with ten times its amount of water, he allowed it to stand until all the corpuscles had settled to the bottom, and then vaccinated with the surface liquid with good results. His next experiment was a most ingenious one. He poured some vaccine lymph into a test-tube, taking care not to wet the sides. Then on this he placed some distilled water so carefully that the two fluids did not mix, but the water lay in a column over the lymph. Then he allowed the tube to stand until diffusion had taken place and all soluble substances were equally divided in the two fluids. As

a proof that diffusion had taken place the water contained albumen. He vaccinated with the fluid at the surface and at the bottom; the latter only gave positive results. He carried his experiments further and made a series of dilutions of the lymph from one up to one hundred and fifty. Up to the 15th dilution it acted just as ordinary lymph, from this on, his results were irregular; he succeeded, however, in making some successful inoculations at the 150th dilution. Now, had the infectious agent in the lymph been soluble, it would have diffused, and the liquid at the surface and at the bottom have been alike infectious, and in the last experiments the power of infection have diminished in a gradual scale, until finally a point would be reached where the fluid would have been wholly innocuous. The results of inoculation when the virus is so diluted, are, it is true, extremely uncertain, still no amount of dilution seems to take away entirely the power of infection. Davaine has diluted the blood of animals affected with anthrax 1,000,000 times, and then has succeeded in producing the disease by inoculation. It would be difficult to conceive of a soluble poison that could withstand such a dilution. It must be remembered also, that when a disease is produced with such diluted fluids it is typical, differing in no whit from the disease produced by the undiluted virus.

From this it seems that on purely theoretical grounds, we must assume that the contagia are living organisms. But we do not have to resort to such arguments. As early as 1855 Bollinger discovered in the blood of animals affected with anthrax, certain rod-shaped organisms. Following him, Branel showed that they were constant in the blood and in the tissues after death; furthermore, that the blood of the fœtus contained no such organisms, and that inoculation with this blood was innocuous. Tiegel and Klebs filtered the blood through clay cylinders, and found that the

filtrate contained no organisms, and had no infectious properties. By these experiments it was pretty clearly proven that the organisms in question, if not the cause of the disease, were certainly very closely connected with it. Still, many facts remained to be cleared up: the fact that small quantities of the blood when dried retained their virulence but a few hours, while large quantities were seemingly always virulent; also the fact that the disease did not seem to spread very much by direct contagion, but certain fields, and even whole districts of country were infected, and animals grazing here, always acquired the disease. The whole matter was cleared up by a publication from Koch, who was at that time but a country physician in a small German village. He cultivated the organisms in suitable fluids, and found that whereas the bacillus itself possessed very slight powers of resistance, at one stage of its development it passed into a condition that made it one of the most resistant of all living organisms. The small rod-shaped body of the bacillus while in the animal, only increases by division, and this process goes on so rapidly that twenty-four hours after two or three have been placed in the blood of a mouse, the whole vascular system will be filled with them. Outside of the body, when placed in favorable conditions, it goes through the following development. The rods grow in length, becoming forty or fifty times longer than when found in the blood. After a time, at certain regular intervals, small, highly refracting dots appear; these enlarge until the thread presents the appearance of a string of beads. Then the intervening substance disappears and the small oblong bodies become free. These are the spores, and their power of resistance is astonishing. They can be dried and kept for years without losing in the slightest degree their virulence. No degree of cold that can be produced affects them, not even that from liquid carbonic acid. They have

been known to germinate after being kept for a month in absolute alcohol. They will even grow in a four-per-cent solution of that vaunted destroyer of all bad things, carbolic acid; and the ordinary processes of disinfection, such as creating a strong smell of sulphurous acid or of chlorine gas, seem only to conduce to their well-being. Boiling water they bathe in with comfort; a heat, however, of over 110° C., removes from them the power of doing harm. There is one agent, which is as yet but little known as a disinfectant, that destroys them even when used in a very dilute form. I allude to the bichloride of mercury. A momentary immersion in a solution of this, one part to 2,000 of water, destroys them, as does also an hour's exposure to a solution 1–20,000. By the discovery of these spores all was cleared up. They would have time to form in a large quantity of blood before it became dry. Where an animal was killed or skinned, they formed in the blood and fluids of the body that escaped. The bacilli were frequently passed from the animal with the dung, and this, in the open air, offered a splendid field for their development. They thus infected the soil, became mixed with the herbage, and were taken into the alimentary canal of the grazing animal; infection following from small abrasions of the mucous membrane caused by sharp stubble or thorns. The fact that epidemics of anthrax sometimes seemed to be connected with wet seasons, has been explained by some recent investigations of Koch; he found that the bacilli would grow well in the ordinary hay infusion. Now when the fields are overflowed, and water is standing on them, from the dried grass and débris a natural hay infusion, so to speak, is made, in which, if any stray bacilli were present they would grow rapidly, and could be carried by the water into other fields. It was found that when a carcass was buried in shallow earth, spores would form from the bacilli in

the carcass, and, according to Pasteur, they are brought to the surface by the passage of the earthworms through the soil. The worm takes them into his alimentary canal as he eats his way along, passes them out in his casts on reaching the surface, and the rain washes them free. Koch and others have found that even in the most suitable fluids, the bacilli will only grow between 17° and 45° C. This has been productive of much good in prophylaxis. To prevent their development in the carcass, it is only necessary to bury it twenty feet below the surface, where the heat never reaches 17° C. Even though the proof of a *contagium animatum* seems so clear and absolute in this disease, there are people who doubt it.

Although tuberculosis for the past three or four years has been generally considered an infectious disease, produced by a specific virus, it was not until the past spring that Koch, who is now the chief in the Gesundheitsamt in Berlin, in one of the most remarkable publications that has ever appeared in the history of medicine, cleared up all doubt as to its exact nature. He showed in a manner that must be convincing to the most skeptical, that the disease was produced by a bacillus, which not only morphologically, but also from the manner of its growth, differed from all known organisms. Bacteria had been found before in tubercular organs; Klebs, Schüller, Aufoect, and others had described them, but none of their alleged discoveries had ever been substantiated. Koch had discovered this bacillus accidentally in some tissue more than a year before, and although the temptation to publish a description of it must have been almost irresistible, he waited until he had cultivated it outside the body, until he knew its whole life history, and this publication in its completeness, in the exactness with which every experiment was carried out, forms actually an oasis in the desert of bacteria literature where

he who reads is refreshed. He finds that the organism requires a heat of between 37°C. and 40°C. for its development, and hence must be purely parasitic, not finding in nature conditions favorable for its growth. The germ is evidently taken into the lungs with the inspired air. Here it grows and infects other parts of the lung, both by extension by continuity, and by aspiration of the sputum from the part affected into other parts. From the lungs it escapes with the sputa, and goes on its baneful career; part of the sputa is swallowed, and the alimentary canal is in this way infected; the greater portion is, however, expectorated, and in this way the disease is passed on to others. Koch cultivates the bacillus in sterilized blood serum, and after cultivations of several months, during which time many successive transplantations from one culture tube to another have been made, he finally inoculates animals from the last cultivation, always with success. In the pathological lesions produced by the inoculated disease, organisms in all respects identical with those he started with, are found. Since Koch's publication has appeared, his results have been verified by numerous observers.

The bacilli are always found in the sputa of tubercular individuals, and when we think of the numbers of people going around, affected with the disease, and sending out millions of the germs with every expectoration, we can easily explain its extraordinary prevalence. For a number of years we have known that the sputum of consumptives, when dried, and blown into the lungs of animals, would produce the disease. These germs become free on the drying of the sputa, and being extremely light must form a large percentage of that compound which we collectively call dust. The fear and aversion which every orderly housewife has for this compound, seems to have been implanted in her breast by a wise Providence, evidently with

an idea tending to the conservation of the human race. True, in the eternal warfare she wages against it, she is not always guided by strict hygienic principles, but, like many other good people, she does the best she knows.

There are many other ways in which infection can take place. Chaveau has shown that the milk of tubercular cows produces the disease in animals fed on it. The disease is a common one in cows, particularly in those kept in large city stables, and there is no doubt but that hundreds of infants are yearly infected in this way.

Relapsing fever, a disease with which we are here practically unacquainted, but which in the poorer classes of Ireland and Russia causes great havoc, is almost certainly produced by a bacterium. In 1868 Obermeier discovered a long thread-like organism in the blood of persons affected with this disease during the period of fever. The disease is marked by periods of perfect freedom from fever, and periods of strong pyrexia. The organisms are only found in the time of fever, and the blood of patients is only infectious at this time. One great difficulty that we have to contend with in experimenting with this disease, is the almost impossibility of infecting lower animals. Up to the present it has only been successfully transmitted to the monkey. The blood of the infected animal shows the same organisms as that of man.

In leprosy a form of bacillus is always found in the nodules caused by the disease. These bacilli differ from the others in size, in being only found in the bodies of cells, and the extreme slowness of their growth. They have been cultivated outside of the body in suitable fluids, and inoculations made with the culture, but without success. This we had reason to expect from the fact that the disease can in no way be transmitted to the lower animals. In accordance with a belief that prevails in all countries where leprosy

is endemic, namely, that it is produced from eating fish, inoculations were made on these animals, but with no better results. The experimenter was rewarded, however, by discovering in the course of his investigations, a disease of fish which is produced by a very large bacillus.

Another disease which seems to be produced by the lower organisms, is septicæmia. This is a disease of which the ordinary citizen of the United States, from reading the daily reports of the condition of our lamented President, and the newspaper criticisms thereon, has a most profound knowledge; would that so much could be said for the pathologist. After death from this disease, numerous abscesses are found in the various organs of the body. These abscesses may be very large or only microscopic in character; they usually form around blood-vessels, and we find in the centre of the abscess small groups of punctiform organisms called micrococci. We also find emboli of the micrococci in vessels around which there are no signs of inflammatory action. Koch has taken up the matter and investigated it very thoroughly, and our knowledge has been enriched by the discovery, that in the lower animals there are several forms of septicæmia, each produced by a specific germ. The germ which produces the most fatal form in mice has no effect on the rabbit, and *vice versa*. What seems especially strange in this connection, is the fact that the wild meadow mice enjoy a perfect immunity toward a virus that kills their house brethren in a few hours. A disease in all respects extremely similar to septicæmia is the endocarditis ulcerosa. Here, too, we have abscesses, and in the centre of each a blood-vessel filled with micrococci.

A description of the different germs that have been described as the causes of diphtheria would fill a volume. At one time it seemed to have been the ambition of nearly every microscopist to find a germ here, and art has been

enriched by a number of the most beautiful drawings representing them. Bacteria certainly are found in the diphtheritic membrane, but what part they play there, is another thing; certainly no better breeding-place could be found than in this foul necrotic membrane. No distinctive forms have as yet been discovered.

In the secretion of gonorrhœa a peculiar form of micrococcus is always found. This organism differs from all other forms in being nearly flat on one side; they always lie together in pairs with the flat surfaces opposing. They have been found constantly in the gonorrhœal secretion in both males and females, also in the purulent ophthalmia due to infection of the eye with the secretion. Still they, or organisms in all respects identical morphologically with them, have been found under other circumstances. I have seen them in the pus of a *post-mortem* pustule. These organisms have been cultivated and inoculations made on animals with them; but here, as in many other cases, animals have shown themselves incapable of acquiring many of our diseases, and the inoculations on them were without result. Six medical students in Buda Pest had sufficient heroism to offer themselves as subjects for inoculation. They were all inoculated in the urethra with the product of a pure cultivation, and after the usual interval, three of them had a typical gonorrhœa. There is no mention made as to whether the subjects were cast into dungeons immediately after the inoculation, and guarded by male jailors, and, in view of the fact that the average continental medical student is peculiarly susceptible to this disease, skeptics will always shrug their shoulders. In another instance, a successful inoculation was made under circumstances that would seem to preclude an accidental infection. An injection of the cultivated virus was made into the urethra of a man about to die from paralysis; a violent urethritis was set up, and

the specific micrococci were found in the secretion. After death, which resulted six days after the injection was made, they were also found in the tissue of the inflamed mucous membrane.

One of the most interesting diseases, the cause of which is certainly a living organism, is the actino-mycosis. The disease is a not uncommon one in cattle, but as yet but sixteen cases of its occurrence in man have been reported. The disease attacks the soft parts, and bones of the jaws, and from there spreads to other parts. Large nodular masses are formed, which are made up of many small tubercle-like nodules; in the centre of each a very peculiar star-shaped organism is found. It seems to form a genus of itself, none of the botanists seeming to know whether it belongs to the myxo- or schizomycetæ. The organism (actinomy) has been cultivated, and successful inoculations made with the culture.

I have now gone over a series of diseases for some of which the proof is direct and absolute that they are caused by certain definite organisms; for others this direct proof is still wanting. In all cases before a bacterium can be proven to produce a disease, the following must be done: The bacterium must in a great number of cases be shown to be always associated with the disease, to be present either in the blood or in the pathological lesions caused by the disease. Next, it must be cultivated in suitable substances outside of the body, and shown to have specific characteristics which may be revealed either by its form, by its reaction toward certain staining fluids, or by its manner of growth. Then, after successive cultivations from the last series, an animal must be inoculated, and a similar disease, offering the same pathological lesions and showing the same bacterium, must be produced.

In some cases we can distinguish the different bacteria

by their form alone. The bacilli differ a good deal from one another in form, as well as in the manner they stain; the micrococci, on the other hand, scarcely differ at all. The forms which have been seen in endocarditis ulcerosa, in septicæmia, and in small-pox, appear to be morphologically identical, but if they do cause these diseases, they must have different properties. It may be that they have differences in form which we cannot recognize. If we were to imagine a rattlesnake and the common black snake reduced to the size of a tubercle bacillus, we would not be able morphologically, or in any other way, to distinguish one from the other, yet the bite of the one is deadly, and of the other harmless. Again, even though the bacteria are morphologically identical, they may have different functions. Take the case that Cohn cites, the sweet and bitter almond trees. Here are two trees exactly alike; they have the same size, the same leaves, the same flowers; the fruit of the one exactly resembles the other, yet from the one we derive a pleasant oil, and from the other a deadly poison.

CALX SULPHURATA IN DISEASES OF THE EYE.

By DAVID WEBSTER, M.D.,
NEW YORK.

(Read before the Materia Medica Society Nov. 23, 1882.)

WHILE the utility of sulphide of calcium in acute suppurative diseases of the ear has been pretty well established by the experiments of Dr. Samuel Sexton, of this city, and while its general anti-suppurative effects have been demonstrated by the committee of the New York Therapeutical Society, very little has been published in this country concerning its use in diseases of the eye. The only account of its use in eye disease that has come to my notice is an article in *The Practitioner* for January, 1882, by "Simeon Snell, Ophthalmic Surgeon to the Sheffield General Infirmary and to the Institution for the Blind," in which he gives the results of his experience in its use in "strumous ophthalmia," including under this head "phlyctenular and pustular conjunctivitis and keratitis." Mr. Snell publishes notes of five cases of phlyctenular disease in which he used the remedy, and in all of them immediate improvement followed its administration. He says: "The sulphide will be found particularly serviceable in those cases of children with manifest strumous habit, enlarged cervical glands, swollen face, the eyelids tightly closed, photophobia, and when, on opening the eyes, a gush of hot tears is

emitted, and examination of the ocular surface discloses one or more phlyctenules on the cornea, or it may be merely increased vascularity of conjunctiva. These cases treated by the ordinary constitutional and local remedies are often tedious, but with the sulphide of calcium, coupled with the usual applications to the eyes, such as atropine and warm fomentations of poppy, or what not, frequently quickly yield a happy result."

During the past year I have myself tried to test the value of the drug in various diseases of the eye, and I herewith present the notes, more or less complete, of thirty cases in which it was used. Some of these cases are from the private case-books of Dr. C. R. Agnew, while the most of them are cases treated by me at his clinic at the Manhattan Eye and Ear Hospital.

Fifteen were cases of phlyctenular conjunctivitis and keratitis. *Two* of these were not improved after taking the medicine, one ten days, the other two weeks. *One* improved while taking the medicine, became worse on leaving it off, resumed it again, and was then lost sight of. *One* improved under the use of the medicine, and got well in seven weeks, but soon after had a relapse, resumed the medicine, and after a faithful trial, receiving no apparent benefit, abandoned it. *One* remained under observation two weeks, during which time he improved but did not recover. *One* improved at times, but would relapse while taking the sulphide, and was under treatment several months, and finally passed from under observation. The remaining *nine* recovered, and were discharged cured in periods varying from a few days to two months.

Many of these were cases of "recurring" phlyctenular trouble, having had from one to five attacks previously; and I have no doubt that some of them, after recovering under the calx sulphurata treatment, *continued to recur*.

It must not be supposed that the internal administration of calx sulphurata was the only treatment in these cases. Generally, all the hygienic instructions were given, and all the local applications employed, that would have been if other internal medication had been resorted to. It would scarcely be wise to expect any medicine to cure a disease while all the causes were in full operation which first produced it. These children commonly had the run of the table, drank freely of tea and coffee, and stuffed their tender stomachs with food fit only for adults with mature digestive powers. Their diet, of course, had to be carefully regulated, and their parents were instructed to bathe them all over several times a week, and keep them out in the sunlight and open air as much as possible. Atropine, pilocarpine, and eserine were dropped into the eyes; calomel was dusted in in some cases; and the eyes were frequently bathed with water, hot, lukewarm, or cold, whichever seemed to benefit most the case under observation.

When various means are used in the same case and at the same time it is difficult to know to which to attribute any amelioration of the disease that may occur. I have seen cases of phlyctenular disease recover under simple hygienic treatment, without any internal medication, and with no local application but water. I am under the impression that not a few of the milder cases would follow this course. But, on the other hand, many cases are extremely obstinate, seem to resist all treatment, and the ophthalmic surgeon, having tried every remedy that suggests itself to his mind, finds to his chagrin that the eye is only going from bad to worse. Although I am not so sanguine as to the good effects of calx sulphurata in the disease under consideration as Mr. Snell seems to be, yet I am of the opinion that it is a valuable remedy, and one that we should keep in mind, and resort to when the ordinary means fail. It

seemed to me that several of the cases in which I used it were markedly benefited very soon after I stopped other internal medication and began the use of the calx sulphurata.

I tried the remedy in *three* cases of ulcer of the cornea, and in all three it seemed to hasten the cure. At least they all made satisfactory recoveries under its use, in connection with the usual local treatment.

In *one* case of traumatic ulcer of the cornea with hypopyon the calx was used, for the first few days with apparent benefit; but soon after the eye became worse, the hypopyon increased, and a paracentesis of the cornea had to be performed, subsequent to which the eye got well.

The drug was tried in *two* cases of kerato-iritis with hypopyon, one traumatic, the other idiopathic, or perhaps rheumatic. In the first the effect of the medicine in clearing up the hypopyon was too marked to admit of doubt. In the other case, two attacks were recovered from quite rapidly under its use, but a third having occurred the patient was placed upon mercurial inunction, which cured him quite as quickly, and since which he has suffered no relapse.

In a case of punctured wound of the eye, followed by irido-choroiditis with hypopyon, the calx failed to arrest the disease, and *phthisis bulbi* resulted.

It was tried thoroughly in one case of episcleritis, but seemed not to exercise any beneficial effect.

It was given in two cases of interstitial keratitis. In one, in which the disease was thoroughly established, it did no good. In the other, a case in which the patient had passed through a long and tedious course of the disease, had recovered, and was threatened with another attack, it seemed to have some effect in arresting the disease.

It was tried in two cases of kerato-irido-cyclitis, but produced no apparent result in either.

In a case of multiple abscess of the face it was used without apparent benefit.

In two cases of hordeolum, it was used with excellent effect, not only rapidly dissipating the sty, but apparently arresting a tendency to recurrence.

I also tried the remedy in granular and catarrhal conjunctivitis; but as it did no good I have not thought it worth while to report any of the cases.

As to the general effects of the remedy, in very few cases were unpleasant results noted. In a few cases it produced *nausea*, and in one case only had to be abandoned on account of diarrhœa.

Phlyctenular Keratitis and Conjunctivitis.

CASE 1.—Gertie B., aged five, came to the Manhattan Eye and Ear Hospital on March 13, 1882, with a phlyctenule, of three weeks' duration, on the temporal margin of her right cornea. A solution of sulphate of atropia was dropped into the eye, and a little levigated calomel dusted in with a camel's hair brush. She was put upon calcium sulphide, gr. $\frac{1}{10}$ four times a day, in the form of tablets. On March 31st, eighteen days later, the phlyctenule had entirely disappeared, and the eye was looking almost as well as the other. She was directed to continue the tablets for a week. On June 21st, nearly three months later, I saw this child again, and made the note: "the eye remains well."

CASE 2.—Emma L., aged five, came to the Manhattan Eye and Ear Hospital on March 20, 1882. She had recurring phlyctenular keratitis, this being the fifth attack. The first attack occurred when she was three years old, and her eyes had been free from inflammation but little of the time since. She was a badly nourished child, had the run of the table, and ate and drank whatever she chose. So great was her photophobia and blepharospasm that on forcing her eyes open in order to apply atropine and calomel, the external canthi were torn, causing slight bleeding. The child was placed upon calcium sulphide, gr. $\frac{1}{10}$ four times a day; her diet was regulated, and her mother was directed to bathe her eyes frequently with cold water, and to keep her out in the open air as much as possible. On April 10th, about three weeks after her first visit, she was sufficiently well to stop treat-

ment, and I have not since learned of any recurrence of the disease.

CASE 3.—Eddie McC., aged three, was brought to the Manhattan Eye and Ear Hospital, with phlyctenular conjunctivitis, on March 31, 1882. The disease had made its appearance about three weeks before. The mother attributed it to a "bad cold." The child still had a cough. The whole conjunctiva, ocular and palpebral, was reddened, and there was some catarrhal secretion. There was a single, well-marked phlyctenule near the inferotemporal margin of the cornea, and no photophobia. The child was placed upon calcium sulphide, gr. $\frac{1}{10}$ four times a day; and a solution of sulphate of atropia, gr. $\frac{1}{2}$ to water ℥ i, was dropped into the eye thrice daily. Ten days later the eye was much improved, the phlyctenule having nearly disappeared, and there being little conjunctival redness or secretion left. The atropine was stopped, and the parents were directed to do nothing to the eyes but bathe them with cold water. The calcium sulphide was continued. After this the child continued to improve, and soon passed out of observation.

CASE 4.—George E., aged two, was brought to the Manhattan Eye and Ear Hospital on January 20, 1882, with recurring phlyctenular keratitis. He was treated in the usual way with atropine, eserine, insufflations of calomel, syrup of iodide of iron, cod-liver oil, attention to hygienic conditions, and so forth, until April 7th, a period of two and a half months, without special improvement. On April 7th he had an abscess of the upper lid, and abscesses on both sides of his neck. The cornea was infiltrated throughout its entire extent, and the aqueous was leaking out through a perforating ulcer. I ordered calcium sulphide, gr. $\frac{1}{10}$ four times a day, and a weak solution of atropine for use at home. At each visit I applied a drop of a two-grain solution of eserine. On April 17th, ten days later, the abscesses were nearly well, the corneal ulcer had healed, and a good deal of the infiltration of the cornea and redness of the eyeball had disappeared. The medicine was now stopped. The eye continued to do well until about the 10th day of May, when there was a relapse. The calcium sulphide was at once resumed, and applications were made to the eye as before.

May 26th.—Considerably better; the eye opens now without force being used.

June 4th.—The parents report that the child now keeps the eye open the most of the time. The whole of the cornea is still hazy,

and at the site of the perforation there is dense opacity with synechia anterior.

Case 5.—John F., aged three and a half, came under observation at the Manhattan Eye and Ear Hospital on April 17, 1882, with blepharitis marginalis of both eyes, and a phlyctenule on the lower corneal margin of the right. His mother was instructed to bathe his eyes frequently with hot water, to keep the edges of his lids greased with vaseline, to keep him on a bread-and-milk diet, and to give him calcium sulphide, gr. $\frac{1}{10}$ four times a day. When seen again, four days later, the eyes were nearly well. We stopped the calcium sulphide on the 24th, and on the 26th discharged the patient as needing no further treatment.

Case 6.—Ann H., aged six, had been suffering from phlyctenular keratitis for two months before her mother brought her to the Manhattan Eye and Ear Hospital on April 19, 1882. She was probably the subject of inherited syphilis, presenting the *bombé* head, the sunken cheek bones, the notched teeth, and the erosions at the angles of the mouth, so characteristic of that disease. In her left cornea was a small central ulcer, and there were several phlyctenules at the sclero-corneal junction. The eye was watery, and sensitive to light. She was placed upon calcium sulphide, gr. $\frac{1}{10}$ four times a day, while the usual applications were made to the eye, and her hygienic condition was looked after.

April 24th.—Eye considerably improved. There is an eczematous patch, as large as a cent, at the left oral angle. The mother was directed to keep this patch smeared with vaseline, and to continue the calcium sulphide. The child continued to improve, and soon passed from under observation.

Case 7.—Robert H., aged three and a half, was brought to the Manhattan Eye and Ear Hospital on May 11, 1882, with recurring phlyctenular keratitis of the left eye. There was also re-ulceration of an old central corneal opacity. His first attack came on when he was a year and a half old. The present attack had lasted since January, a period of four or five months. Sulphide of calcium, gr. $\frac{1}{10}$ six times a day, was ordered, and the usual applications were made to the eye.

May 22d.—The child begins to open the eye much better.

May 29th.—The eye is nearly well. To stop treatment, and to come again if there is any recurrence of the inflammation.

Case 8.—Lizzie F., aged three and a half, was brought to the Manhattan Eye and Ear Hospital on June 12, 1882, for treatment of phlyctenular conjunctivitis, dating from an attack of

measles some weeks previously. Her face, chin, lips, eyelids, and forehead were covered, more or less thickly, with an eczematous eruption, and there was an enlarged gland on the right side of her neck. The conjunctiva of both eyes was reddened and thickened. There were small pustules of the conjunctiva near both corneal margins. She had a running nose, lachrymation, photophobia, and severe blepharospasm. A solution of eserine, gr. $\frac{1}{2}$ to water ℥ i, was dropped into the eyes, and the mother was directed to keep the parts covered by the eruption well greased with vaseline. Calcium sulphide, gr. $\frac{1}{10}$ four times a day, was ordered.

June 26th.—Her mother says she got almost well, but for the last few days has been nearly as bad as ever. After the first week the child refused to swallow the calcium sulphide, on account of its nauseating effects. She was now placed upon syrup of iodide of iron, m. v. ter in die ; atropine and calomel were applied, and the eyes were bathed often with cold water.

July 5th.—The right eye is much better. The left has a cloudy cornea, and a large peripheral ulcer.

July 24th.—The ulcer is healed.

Case 9.—Josie F., aged five, came to the Manhattan Eye and Ear Hospital on May 8, 1882. She had phlyctenular keratitis, and an inverted eyelash at her outer canthus, which contributed to the irritation. This eyelash was extracted, and was either frequently reproduced or else the neighboring lashes had a vicious tendency to inversion, for at almost every visit an inverted eyelash had to be extracted from that external canthus. She was treated after the most approved methods until June 28th, when I placed her upon calcium sulphide, gr. $\frac{1}{10}$ every hour. On June 30th, two days later, the eye was so much improved that I stopped the medicine, and directed the mother to do nothing for the eye but bathe it frequently with cold water.

Case 10.—Miss Fannie O., aged twenty-two, was referred to me for treatment by my friend, Dr. G. R. Bourke, on Feb. 8, 1882. She had a single very large phlyctenule over the insertion of her right external rectus. The eye was treated with a camphor-and-borax wash, and with daily insufflations of calomel. Turkish baths were recommended, but she objected to them on account of the exposure. The phlyctenule disappeared after about three weeks' treatment.

March 14th.—Another large phlyctenule made its appearance yesterday at the supero-temporal margin of the right cornea. She

was now placed upon calcium sulphide, gr. $\frac{1}{10}$ four times a day, with local treatment as before. On March 20th, the eye being worse, the calcium sulphide was increased to gr. $\frac{1}{4}$ three times a day. On April 1st, she was entirely well. She was directed to continue the medicine one week. Another relapse occurred on the 20th, and she continued to take the calcium sulphide, gr. $\frac{1}{4}$ three times a day, till May 1st, when, getting no better, she stopped it, and was put upon syr. fer. iod., m. xv ter in die. She now soon began to improve, and, having left off working in a dark and unhealthy place, has since had no relapse.

CASE 11.—March 24, 1882, Annie M., aged four, is suffering from a third attack of phlyctenular keratitis. She had her first attack when two weeks old. The present attack has already gone on for two months under the usual treatment. Ordered calcium sulphide gr. $\frac{1}{10}$ four times a day.

April 24th.—Her mother says that while taking the pills her eyes were not quite so bad. She has been taking rhubarb and magnesia for a week. Her eyes are now worse, and she has a pustular eruption on her arms and back. She was again put upon the calcium sulphide.

CASE 12.—Lida V., aged thirteen, came to the office on Feb. 14, 1882. She said she had been under Dr. Agnew's care, off and on, since eight years old, with phlyctenular keratitis of right eye. There is now conjunctivitis with diffuse corneal opacity.

R.V.$=\frac{20}{100}$; no improvement with glasses. L.V.$=\frac{20}{30}$; $\frac{20}{20}$ with $-\frac{1}{72}$. A wash of camphor and borax was ordered.

On March 24th, she returned with phlyctenular conjunctivitis of the left eye. Calomel was dusted into the eye, and calcium sulphide, gr. $\frac{1}{10}$ four times a day, was ordered.

April 14th.—Better. Continue the treatment.

April 22d.—The eye is worse again, and her mother says this is the most protracted attack she has ever had. Stop the calcium sulphide and take rhubarb, gr. ij; sodæ bicarb., gr. ij; ipecac., gr. $\frac{1}{4}$, twice a day. To take a Turkish bath.

May 23d.—Her mother thinks she was worse after the Turkish bath. To resume the calcium sulphide.

The keratitis persisted, despite all treatment, until she was sent into the country, where the child recovered with little or no treatment.

CASE 13.—Josephine G., aged one, was brought to the office on January 3, 1882, with phlyctenular keratitis of the left eye. Dr. Agnew advised that she be weaned and put upon milk-and-barley gruel.

March 21st.—The child has been under treatment, off and on, since last date. At her last visit some rhubarb, soda, and ipecac. powders were ordered. They physicked her very much, causing ten passages a day, so her mother stopped giving them. She was now placed upon calcium sulphide, gr. $\frac{1}{10}$ four times a day.

May 24th.—She took the tablets a week, but without apparent benefit. She is now much worse.

Case 14.—Kittie C., aged twenty-one months, was brought to the office on Feb. 28, 1882, with phlyctenular keratitis of three months' standing. The right eye only was affected, and the right ear was the seat of an otitis media suppurativa chronica. She was put upon wine of iron and hygienic measures were resorted to, but on April 22d she was as bad as ever. She was then put upon calcium sulphide, gr. $\frac{1}{10}$ ter in die. She continued the medicine until May 2d, when, not having improved, the usual treatment was again resorted to.

Case 15.—Mary M., aged two, was seen by me at the Manhattan Eye and Ear Hospital on July 3, 1882. She had been under treatment, on several occasions, for recurring phlyctenular keratitis, and had each time got well under the usual treatment. This time I ordered calcium sulphide, gr. $\frac{1}{10}$ every hour. On the 5th, two days later, she seemed much better, keeping her eyes open, and holding up her head most of the time. The medicine was ordered to be continued. On the 12th, a week later, she had relapsed, and was about as bad as ever. I then abandoned the use of the sulphide and resumed the usual treatment, and the child recovered.

Ulcer of Cornea.

Case 16.—Kate C., aged fourteen, came to the Manhattan Eye and Ear Hospital on March 24, 1882. She said her left eye had been sore, off and on, for five years. The present attack had lasted four or five weeks. Inspection showed an ulcer of the cornea, about two lines in diameter and circular. The eyeball was injected, and several blood-vessels ran upward from the corneal margin to the ulcer. There was a good deal of lachrymation and photophobia. A weak solution of atropine was ordered to be dropped into the eye three times a day, and the patient was directed to take calcium sulphide, gr. $\frac{1}{10}$ four times a day.

April 28th.—The ulcer is healing, and there remains very little injection of the eyeball. The lachrymation and photophobia have disappeared. Stop the calcium sulphide, and do nothing to the eye but bathe it with salt and water.

CASE 17.—Michael C., aged six, was referred to me, on May 8, 1882, by Dr. G. R. Bourke, for treatment of inflammation of his right eye. I found a small central ulcer, with a yellowish appearance surrounding it, as from pus between the corneal layers. I placed the child upon calcium sulphide, gr. $\frac{1}{10}$ four times a day, and advised the local use of atropia, and bathing with salt and water. The child made a rapid recovery.

CASE 18.—Miss M. C. S., aged twelve, a private patient of Dr. Agnew's, was seen July 7, 1881, when the existence of an old corneal opacity of the left eye was noted.

On June 20, 1882, she came with a severe catarrhal conjunctivitis of the same eye, which had gone on for a week. A camphor-and-borax wash was ordered.

On June 26th she came again with several small corneal ulcers, and a general haziness of the cornea, as from infiltration. Along with this condition there was slight chemosis. Iced cloths were ordered to be applied half the time, and atropine to be dropped into the eye three times a day.

On June 28th she stated that the iced cloths had given relief at first, but the last two hours she had used them they made the eye ache. The condition of the eye was about the same. She was ordered to bathe the eye frequently with tepid water, to continue the atropine, and to take calcium sulphide, gr. $\frac{1}{10}$ every hour.

On July 3d, five days later, she reported that she had taken the medicine as directed, but that it had kept her nauseated. The eye was slightly better. The calcium sulphide was stopped, and she was put upon citrate of iron and quinine.

On July 11th the eye was nearly well, and the patient was discharged.

Ulcer of Cornea with Hypopyon.

CASE 19.—John K., aged forty-five, came to the Manhattan Eye and Ear Hospital on Sept. 11, 1882, on account of an injury to his right eye by a blow of a piece of wood over a week previously. There was a large central corneal ulcer with extensive hypopyon. He was placed upon calcium sulphide, gr. $\frac{1}{10}$ every two hours. He was ordered to drop into the eye a solution of atropine, four grains to the ounce, three times a day, and to bathe the eye frequently with hot water. On the 13th the hypopyon had diminished, but after that remained about the same until the 22d when the amount of pus in the anterior chamber having

visibly increased, the calcium sulphide was stopped, a paracentesis was performed, and a bandage applied. The eye began to improve soon after, and finally recovered with corneal opacity, but with useful vision.

Kerato-iritis with Hypopyon.

CASE 20.—Aug. 14, 1882, Mrs. A. M. T., aged forty-five, came to the Manhattan Eye and Ear Hospital with inflammation of the right eye caused by the accidental spattering of catsup into it. There was a large plaque of exudation into the corneal tissue, partially obscuring the pupil, and a little pus in the bottom of the anterior chamber. The instillation of atropine revealed the presence of adhesions. She was directed to use six drops of atropine, ten minutes apart, morning, noon, and night.

Aug. 18th.—Adhesions have given way, but the keratitis and hypopyon remain about the same.

April 28th.—The patient came to the office a few days ago with the hypopyon increased, and was put upon calcium sulphide, gr. $\frac{1}{10}$ every hour. The pus has now entirely disappeared.

The patient was seen some weeks later, when all signs of inflammation had disappeared from the eye, a slight corneal opacity, not preventing useful vision, remaining.

CASE 21.—W. J. P., aged thirty-six, was treated by Dr. C. R. Agnew, in April, 1875, for episcleritis of his right eye. His habits were not good, he chewed tobacco, and was the subject of indigestion and rheumatism. He never had syphilis, but had an attack of gonorrhœa some sixteen years before. On June 8, 1882, he returned, stating that the inflammation had come on again, very suddenly, the morning before. There was now considerable hypopyon, the iris was discolored, the pupil small, the whole eye red, lachrymose, and sensitive to light. I kept him at the office for a couple of hours, and instilled a four-grain solution of atropine five times, but the pupil yielded only very slightly. He was directed to take a Turkish bath.

The next day (June 9th) the pupil was slightly dilated upward. Atropine six times an hour three times a day was ordered, and calcium sulphide, gr. $\frac{1}{10}$ four times a day, internally. He was instructed to bathe the eye with hot water for a minute or two every hour.

On *June 12th* (three days later) the pupil was found to be widely dilated and circular, and the pus had all been absorbed

from the anterior chamber. The patient was directed to stop the calcium sulphide and to go on with the atropine, one drop thrice daily.

On June 17th, five days after last visit, the patient appeared again, and said that he had been kept awake for the last two nights by pain in the eye. Inspection showed that a small amount of pus had again made its appearance in the anterior chamber, and the eye was again very red and irritable looking. Calcium sulphide, gr. $\frac{1}{2}$ four times a day, was ordered, and bathing with hot water as before. The inflammation quickly yielded to the treatment pursued.

On June 27th there was another relapse, when the patient was placed upon mercurial inunction and, internally, citrate of iron and quinine.

On June 29th he reported " much better," and on July 3d the diseased eye seemed almost as well as its fellow. Treatment was now stopped, and there has been no recurrence since.

Traumatism.

CASE 22.—C. C., aged sixteen, came to the office April 23, 1882, with a penetrating wound of the left eyeball, produced by a blade of a pair of scissors. The wound was at the infero-nasal edge of the cornea. There was an opening through the iris, and the periphery of the lens was injured. The patient being seen but a few hours after the injury, the anterior chamber was partly empty, partly filled with blood. Vision was reduced to ability to count fingers. Atropine was dropped into the eye and a bandage applied. The next day the blood was all absorbed, the anterior chamber re-established, and the vision $\frac{20}{70}$.

April 30th.—A week after the injury the patient reported that he had pain in the eye, for the first time since the injury, keeping him awake most of the night. $V=\frac{20}{100}$, eye very red, pupil small. Ordered atropine, iced cloths, and an opiate at bedtime to relieve pain.

May 3d.—Anterior chamber one fourth filled with pus. Ordered calcium sulphide, gr. $\frac{1}{2}$ thrice daily.

May 4th.—Irido-choroiditis ; vision reduced to perception of light. The sulphide of calcium was continued for about a week, but the eye went on from bad to worse.

On June 6th it was noted that the eyeball was atrophied, and that through the pupil, in the infero-temporal portion of the fun-

dus, could be seen a large mass of exudation tinged with red. The fellow eye had vision $\frac{20}{20}$, and did not suffer from sympathetic irritation.

Episcleritis.

CASE 23.—Mrs. H. B., aged thirty-two, was treated for episcleritis of her right eye, at the Manhattan Eye and Ear Hospital, for nearly two years. She recovered, and remained well about a year. The disease recurred in April, 1882, and returning to the hospital for treatment, I placed her upon calcium sulphide, gr. $\frac{1}{2}$ thrice daily. She continued the medicine until she had taken fifty pills, but with no apparent benefit. She was then placed upon the salicylic-acid treatment, which had benefited her in the previous attack. She remarked that the latter medicine "seemed to help the eyeball, but made the lids sore and swollen."

Interstitial Keratitis.

CASE 24.—George Miller, aged seventeen, stone-cutter, came to the office on July 13, 1882, with interstitial keratitis of both eyes. He had Hutchinson's teeth, and other marks of inherited syphilis. He could count fingers at three feet with the right, and at one foot with the left eye. Dr. Agnew placed him upon a bread-and-milk diet, directed him to have atropine dropped into the eye daily, to bathe the eyes frequently with hot water, and to take calcium sulphide, gr. $\frac{1}{10}$ eight times a day. Fifteen days later we heard from his family physician that his eyes were getting worse, and that he could not count fingers at all with either eye. He was then directed to stop the sulphide and to take hydrarg. bichlor., gr. $\frac{1}{32}$ ter in die. On September 5th this doctor wrote: "The Miller boy is improving. The left eye, which was the worst, is now the best, and the right has improved a little." The patient was, after a time, able to resume work.

CASE 25.—R. M. C., aged eighteen, gives a history of ophthalmia neonatorum, and of interstitial keratitis at the age of nine, from both of which he recovered with good sight in both eyes. He again came under observation, at the office, on July 15, 1880, with interstitial keratitis of the right eye, and recovered, with a corneal opacity, after a tedious course of nearly a year.

On June 24, 1882, he came with what seemed like a very large phlyctenule over the insertion of his left internus. I feared that it was the starting-point of another attack of interstitial keratitis, and at once placed him upon calcium sulphide, gr. $\frac{1}{10}$ every hour.

On June 26th he reported that he had taken a pill every hour except when asleep.

He had had two evacuations a day instead of one. The eye was much better, and he was told to continue the pills.

On July 21st he stated that after taking the pills for two or three days after his last visit, a diarrhœa set in, and he had to stop the medicine and take "hot drops."

On July 29th the eye was well, and he has since had no relapse.

Kerato-irido-cyclitis.

CASE 26.—Miss A. C., aged thirty-two, came to the office for treatment on Oct. 21, 1879. She was a scrofulous subject, possibly the victim of inherited syphilis, and gave a history of severe inflammation of both eyes at the age of ten, with more or less inflammation in them ever since. She had old corneal opacities of both eyes, with a good deal of circumcorneal injection. R. V. = $\frac{3}{200}$, L. V. = $\frac{20}{30}$. Her history is too long to report in full, as she has been under treatment most of the time up to the present, and her right eye is still much inflamed. She has had paracentesis performed upon both eyes several times, and has had one iridectomy upon the left eye and two upon the right. Her case is introduced here in order to state that during one of the severer of her relapses the sulphide of calcium was thoroughly tried, being given in half-grain doses thrice daily from April 12th to May 8th without appreciable benefit.

CASE 27.—Mrs. Mary M. F., aged thirty-four, another case of kerato-irido-cyclitis, was treated both at the office and at the Manhattan Eye and Ear Hospital. When we first saw her, on Nov. 11, 1881, the left eye had been sore for nearly six months, during which she had been under treatment by a female irregular practitioner in Brooklyn. The eye was extremely painful, and she had contracted the morphine habit, which she is still unable to relinquish. Among the many remedies resorted to, in her case, sulphide of calcium was hopefully and thoroughly tried, but without the slightest apparent benefit. An iridectomy seemed to do good for a time, but soon there was a relapse, and the eye seemed worse than before. Having learned that she once suffered from lead poisoning, the mineral having found its way into her system by absorption through a birth-mark covering the nose and the lids of one eye, and which she had kept painted with a cosmetic containing lead, and that she had been cured by sulphuret of potash

baths, I advised her to give the baths a trial again. She took the baths daily for several weeks, and much to my surprise and gratification presented herself before me with her eye entirely free from inflammation.

Granular Lids and Pannus with Abscesses.

CASE 28.—Joseph M., aged ten, came to the Manhattan Eye and Ear Hospital, Aug. 11, 1882, with granular lids and pannus got in an orphan asylum several years before, and was subjected to the usual treatment until the 28th, when a tendency to abscess developed itself, no less than five appearing on lids, forehead, nose, and cheek. Calcium sulphide, gr. $\frac{1}{10}$ every two hours, was now ordered. The medicine was kept up for nearly a week with no apparent benefit, when the abscesses were opened and their contents squeezed out.

No more abscesses occurred.

Hordeolum.

CASE 29.—Margaret F., aged fifteen, was referred to me at the Manhattan Eye and Ear Hospital, by Dr. C. Adam, on June 12, 1882. She had a sty on the right upper lid, of two or three days' duration. She was put upon calcium sulphide, gr. $\frac{1}{10}$ every hour, until ten a day were taken. On June 16th the sty was nearly well. On June 19th a second sty made its appearance on the upper lid of the other eye. She was ordered to take the calcium sulphide as before.

On June 23d it was noted that "the sty did not go on to maturity, but was apparently arrested by the drug, and is now nearly well."

CASE 30.—L. Mc C., aged nine, came to the office, Sept. 5, 1882, with a large sty on one of her upper eyelids, which had already burst. She had been subject to sties, three or four a year, for the last three years. I ordered calcium sulphide, gr. $\frac{1}{10}$, six to be taken each day until the swelling should have passed away, and to be repeated at once upon a threatened recurrence of the disease. I have reason to believe that I would have been informed, in this case, had the calcium sulphide failed to control the tendency to hordeolum.

ON THE ANATOMY AND PHYSIOLOGY OF THE SMALL MUSCLES OF THE HAND.

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WE have chosen the small muslces of the hand for the subject of this article, for the reason that there exists some discrepancy of opinion about their action. The literature concerning them is very much scattered; besides, in the English language we do not know of any writing in which their anatomy and physiology are well described. We do not pretend, however, to treat of their anatomy in a very complete manner, but shall only give those points which are most important for our purpose. Our efforts shall be directed more specially to the elucidation of their physiological action.

It will be most convenient to describe the small muscles of the hand according to the region which they occupy. The dorsal interossei, being the most superficially situated of all the interosseous muscles, will form our first subject of study. We shall then consider the lumbricales as being the most superficially situated in the palm of the hand, continuing with the study of the palmar interossei, and terminating with the consideration of the muscles situated in the thenar and hypothenar eminences.

DORSAL INTEROSSEOUS MUSCLES.

Anatomy.—The first dorsal interosseous deserves to be described apart, as its origin differs somewhat from that of the other muscles belonging to the same group. Like all the other dorsal interossei, this muscle has two points of origin : one external and posterior, the other internal and anterior.

The outer portion arises by short, shiny, tendinous fibres from the trapezium, the capsular ligament of the thumb (carpo-metacarpal), and by muscular fibres from the upper two thirds of the inner border of the first metacarpal bone. From these points the fibres pass obliquely downward, inward, and forward ; shortly before reaching the metacarpo-phalangeal articulation of the index finger, they terminate in a tendon which is immediately joined by the tendon belonging to the inner portion of the muscle. The inner or anterior portion originates by short tendinous fibres from the ligament connecting the second metacarpal bone to the trapezium, from the head and the entire length of the radial surface of the second metacarpal bone; thence the fibres pass almost vertically downward and forward, to join the external portion of the muscle and its tendon. Once united, the common tendon crosses along the outer surface of the metacarpo-phalangeal articulation of the index finger, to be inserted into the radial side of the base of the first phalanx of that same finger ; that part of the tendon which belongs to the first or outer portion of the muscle being attached to the radial side, the other to the angle formed by the union of palmar with the radial surface of this bone. From this insertion of the tendon tendinous fibres can be seen passing from it, over the dorsum of the first phalanx, to the opposite side of the finger. These fibres may be divided into two distinct sets: 1st, the fibres forming the first category pass vertically from one

side of the finger to the back of the articulation, where they meet and decussate with similar fibres coming from the opposite side of the articulation. (It is in this way that the posterior ligament of the metacarpo-phalangeal articulation is ultimately formed.) 2d, the second set of fibres may be followed obliquely backward and downward to the head of the first phalanx; there, like in the preceding case, they cross, some above, others beneath, the three divisions of the long extensor tendons, to which they adhere very firmly; and, at last, they are lost in the tissues surrounding the second joint of the fingers.

By many authorities we are told that the tendinous fibres coming from the dorsal interossei accompany the tendons of the long extensor muscles to their insertion into the base of the last phalanges; this may be true for some of these muscles; but in the case of the first and second interosseous muscles at least, it is easy to demonstrate that the tendons of these muscles do not reach to the end of the fingers, and that the tendons which run along the sides of the dorsum of the fingers belong to other muscles, very distinct, both anatomically and physiologically, from the dorsal interossei, and of which we shall have to speak further on.

The second, third, and fourth dorsal interossei are bipenniform; they originate by a double head from the contiguous sides of the metacarpal bones between which they are placed, and also by tendinous fibres from the ligaments connecting these bones to the carpus. But this origin is not the same for both of these heads: the head which takes its origin from the lateral surface of the metacarpal bone corresponding to the finger into which the tendon of the muscle is inserted, arises from the whole length of this surface; the other head, on the contrary, arises from the upper half or two thirds only of the lateral surface of the opposite

bone, and also, partly, from the upper portion of its dorsal surface. From this double origin the muscular fibres converge from above downward toward the middle of the interosseous space, where they end in a broad flat tendon, which they accompany to the side of the metacarpo-phalangeal articulation. In the case of the first and second dorsal interossei this tendon is inserted into the radial side of the first phalanx, near its palmar surface. From this insertion two sets of fibres pass obliquely backward and downward, as in the case of the first dorsal interosseous described above. The tendons of the third and fourth dorsal interossei are arranged in a manner different from the one followed by those of the first and second muscles of this group. After reaching the metacarpo-phalangeal articulation, the tendon of each of these muscles divides into three parts, each of which follows a different direction, viz.: one upper, one median, and one inferior, or direct. Two of these, the upper and the median portions, are in all respects similar to those two sets of fibres that we have already described as belonging to the first and second dorsal interossei, and terminate, like them, partly on the base of the first phalanx, and partly on the three divisions of the tendon of the long extensor muscles; the third or lower division, however, passes directly backward along the side of the finger, and downward to the base of the third or last phalanx, into which it is inserted, together with a similar tendinous band, coming, in the case of the middle finger, from the second lumbricalis, and in that of the ring finger, from the conjoined tendon of the third lumbricalis and second palmar interosseous. The anatomical description that we have given above of the insertions of the tendon of the dorsal interosseous muscles, does not correspond, in many respects, to that usually found in standard anatomical works, in which, furthermore, a great diversity of opinion exists on this subject.

Indeed, some of them seem to have confounded either the tendon of the lumbricales or that of the palmar interosseous muscles for the tendon of the dorsal interossei; others recognize only one common tendon to all three muscles; while others still speak of the actions of the interossei without discriminating between the widely different actions of the two groups of interossei. In one word, there is the utmost discrepancy and confusion in the various descriptions given by many authors.

Thus, John and Charles Bell,[1] writing in 1826, describe these tendons as uniting with the lumbricales and extensors to be inserted into the back of the finger.

Robert Harrison,[2] Gray,[3] etc., say that they are attached to the side of the finger to which they correspond, and into the extensor aponeurosis.

Jamain[4] believes them to be inserted into the superior extremity of the first phalanx and into the border of the extensor tendon to which they correspond; while according to Duchenne[5] (de Boulogne) the tendon of these muscles is composed of two portions: the one corresponding to the side of the metacarpal bone, which is on a same line with the finger into which the tendon is inserted, is attached to the entire length of the first phalanx of this finger; the other running on the back of the second phalanx to the base of the third one, into which it is inserted. On the other hand, Sappey,[6] while speaking of these muscles, the tendon of which he also divides into two portions, says: "One (portion) of a grayish color is inserted into the first phalanx of

[1] "The Anatomy and Physiology of the Human Body," 5th American edition, New York, 1827, p. 218.

[2] "The Dublin Dissector," 5th edit., Dublin, 1847, p. 179.

[3] "Anatomy, Descriptive and Surgical," new American edit., Phila., 1878, p. 424.

[4] "Nouveau traité élémentaire d' anatomie descriptive," Paris, 1867, p. 292.

[5] "De l' électrisation localiseé." 2me edit., Paris, 1861, p. 780.

[6] "Traité d' anatomie descriptive," 2me edit., Paris, 1869, t. ii, p. 373.

the index, middle, and ring fingers, on the side corresponding to the principal origin of the muscle; *i. e.*, on the side toward which abduction takes place"; while the other portion he believes to be continuous with the corresponding extensor tendon. Thus, it is evident that the anatomists are far from being in accordance as regards the insertion of the tendon of these muscles, and that the question is still enveloped in a doubt, and deserves to be elucidated.

Evidently this diversity of opinion is due to the fact that we have already mentioned; *i. e.*, that the tendons of these muscles have been mistaken, the one for the other. Nevertheless, we will not be surprised at the many different and conflicting views coming from the pen of such accomplished masters as Sappey, Duchenne, Gray, Broca, etc., on a question apparently so simple in itself, if we remember that there is much in those small clefts left between the metacarpo-phalangeal articulations, where all these tendons, both large and small, come, meet, run together, and intermingle, to discourage those that are not prepared to fight against many provoking annoyances.

From the anatomical considerations detailed above, we might at once conclude that the dorsal interossei do not fulfil all the functions that have been attributed to them. That this is true, at least as far as the two first dorsal interossei are concerned, we shall try to prove in the following discussion on their physiology:

Physiology.—In order to gain a clear idea of the various and extensive movements with which the fingers and the hand, in general, are endowed, we shall, with Cruveilhier,[1] divide the hand in two segments by an imaginary line passing through the longitudinal axis of the middle finger. We shall call all the lateral movements that are effective in drawing the fingers away from that imaginary line, abduction; all those bringing the fingers side by side will be called adduction.

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[1] "Traité d' anatomie descriptive," 5me edition, Paris, 1871, p. 704.

From what has been said in the anatomical description of the dorsal interosseous muscles concerning their origin and the insertion of their tendon, and from the experiments we have instituted on these muscles during life as well as after death, we are led to conclude that they are the principal abductors of the fingers and flexors of the first phalanges on their metacarpal bones.

These actions we have been able to determine on carefully prepared dissections, by tying strings to the belly of the muscle and pulling in the direction of its long axis. By this method we have invariably produced flexion of the first phalanx, and abduction of the finger on the side into which the tendon of the muscle is inserted. But this is not all; there is another movement, of secondary importance, immediately connected with the action of the dorsal interosseous; it is the movement of rotation which takes place on the longitudinal axis of the finger upon which the muscle acts. This rotation is from without inward for the index and middle fingers, and from within outward in the case of the ring finger. All these functions are susceptible of demonstration on the living body as well as on the cadaver. Indeed, it is easy to reproduce them at will, by the use of electricity applied in the proper way and place.

Besides the electro-muscular explorations, these facts are unfortunately too often confirmed by pathological observations. We have often seen cases of saturnismus, in the service of Dr. Seguin, at the Manhattan Eye and Ear Hospital, in which the paralysis of the dorsal interossei was yet incomplete; in these cases the patients can abduct their fingers with comparative ease, but as soon as they are directed to extend the two last phalanges of their fingers, it becomes quite impossible for them to do so, and this even when their first phalanges are artificially extended and supported. On the contrary, when they try to extend the two

last phalanges of their fingers, flexion of their first phalanges takes place, and their fingers become widely separated. Now, if in these same cases and to these same muscles we apply the stimulus of electricity, we notice that their reaction to the current gives rise to flexion, as well as to abduction, of the first phalanges. If now, by some kind of artificial contrivance, we extend the first phalanges and maintain them in this position while an electric current of the required kind is made to pass through the dorsal interosseous muscles, we never notice any extension of the two last phalanges (*except in the case of the third, and sometimes, although rarely, in that of the fourth interosseous*), but only abduction of the fingers, and a movement backward of the metacarpal bones. This movement backward of the metacarpal bones is doubtless due to the fact that the first phalanges having been placed in a position from which they cannot move, the interossei inserted into them have to react upward upon the points from which they take their origin; *i. e.*, upon the metacarpal bones themselves. But we cannot treat of this question here, as it would lead us too far from the subject under discussion. Let us simply add that in our researches we have been unable to prove the correctness of the view entertained by many authorities making the dorsal interosseous play the rôle of an extensor muscle. This view, although not generally mentioned, is far from being new. Duchenne [1] (de Boulogne) tells us that the ancients had recognized its existence, but that they did not attach much importance to it. John and Charles Bell, in their "Anatomy and Physiology of the Human Body," write as follows: "They join their tendon to those of the extensor and lumbricales; they have therefore one common office with them, that is, extending all the joints of the fingers." [2]

[1] *Loc. cit.*, p. 780.

[2] *Loc. cit.*, p. 219.

Sappey says: "The interossei have for office, 1st, to communicate lateral movements to the fingers; 2d, to flex their first phalanx; 3d, to extend the two last ones. The interossei reinforced by the lumbricales bear the same relation to the extensor communis digitorum, as the flexor perforans to the perforatus." This view, as already mentioned, we have not been able to corroborate, either by anatomical or by electro-physiological investigations.

A word or two must still be said regarding the pathological cases furnished by Duchenne (de Boulogne), as conclusive in determining the action of the interosseous muscles.

To our mind, the cases of plumbism with wrist-drop, as well as the cases of injury to the nerves, which are distributed to the small muscles of the hand, are inconclusive.

In the case of plumbism, for example, where the small muscles of the hand are not deeply involved, it is hard to determine whether it be the dorsal interossei which act alone, or whether it be the palmar ones, or even the lumbricales, or at last all of these muscles which perform together the movement of extension of the two last phalanges, when the first ones are extended and supported in this position.

But we shall refer to this point further on, and pass for the present to the study of the lumbricales.

LUMBRICALES.

Anatomy.—These are four small fleshy muscles situated in the palm of the hand, and denominated from without inward, respectively, the 1st, 2d, 3d, and 4th. These are the musculi fidicinales of Cowper. They extend from the lower border of the anterior annular ligament above, to the outer aspect of the metacarpo-phalangeal articulation of the finger below. Fusiform in shape, these muscles originate from

the tendons of the flexor profundus, just where they emerge from under the lower border of the anterior annular ligament. The 1st and 2d muscles, larger than the two remaining, originate respectively from the anterior and outer surfaces of the tendons of the flexor profundus which belong to the index and middle fingers; the 3d arises from the adjoining borders of the tendons of the middle and ring fingers; and the 4th, from the tendons of the ring and little fingers. From their origin these muscles pass, the 1st obliquely downward and outward, the 2d almost directly downward, and the 3d and 4th obliquely downward and inward, to the radial side of the metacarpo-phalangeal articulations of the ring and little fingers, very near the angle formed by the junction of their radial with their palmar side; at that point each muscle terminates in a tendon which at first narrow and rounded, becomes greatly flattened and widely expanded as it passes from the palmar aspect of the hand to the dorsum of the finger. For convenience of description we shall divide the fibres resulting from the spreading out of this tendon into three sets, viz.: a superior, a median, and an inferior set. The upper set of fibres corresponds to the metacarpo-phalangeal articulation, and pass directly backward to the dorsum of this articulation. In their course backward these tendinous fibres meet other fibres of the same kind, which, in the case of the index and middle fingers, are derived from the expansion of the tendon of their own dorsal interosseous muscle situated on the same side with, and following the same direction as, their lumbricalis. In the case of the ring and little fingers, the tendinous fibres which meet those coming from the lumbricales belonging to these fingers, are derived from the palmar interossei which also belong to these same fingers; these fibres, as already stated, pass vertically to the dorsum of the metacarpo-phalangeal, articulation, which

they cross, and decussate with similar fibres coming from the ulnar side of the fingers, thus assisting in forming the dorsal ligament of this articulation. The second set of fibres pass obliquely backward and downward, in such a way as to form a strong aponeurotic sheath on the radial side and back of the first phalanx, as far down as the articulation of the first with second phalanx. In their course downward these fibres cross over the back of the first phalanx of the finger to its opposite side; passing either upon or beneath the three divisions of the extensor communis tendon to which they are intimately adherent, decussating also with similar fibres coming from the ulnar side of the finger. After reaching the posterior aspect of the second joint of the fingers some of them help in completing the cap, if we may so call it, formed by the spreading out and decussation in all directions of the tendon of the extensor communis; the remainder pass downward to the base of the second phalanx, into which they are inserted. The third set of fibres coming from the lumbricales, and which we have called the inferior, may as well be denominated the direct fibres, for they may be followed without difficulty from the very point where they originate to the side of the dorsum of the finger, to the side of the second joint of the finger, and to their final insertion into the base of the third or last phalanx of the finger. At this point these tendinous fibres may, at times, also be demonstrated to partly decussate with similar fibres coming from the opposite side of the finger, in such a way that one half of the tendon of the lumbricalis which comes from the radial side of the index finger is inserted into the ulnar side of the base of the last phalanx of this finger, while the other half, the outer, together with tendinous fibres coming from the opposite side, into the radial side of the base of that same phalanx. It is very probable that the inferior bundle of

tendinous fibres, which we have called the direct fibres, contain others which have crossed the median line from the opposite side. It is evident, then, that our anatomical investigations do not corroborate the universally admitted opinion, that the tendon which terminates at the base of the last phalanx is composed either exclusively of fibres coming from the tendon of the extensor communis, or from fibres coming partly from the tendon of that muscle and partly from the "common tendon" into which the dorsal and palmar interosseous muscles, as well as the lumbricales, terminate. This view, which is maintained in all the well-known works on anatomy, shall not be accepted by us, for we have shown above that the few fibres coming from the tendon of the dorsal interosseous muscle do not descend beyond the second articulation of the finger, and that most of them are inserted into the lateral aspect of the base of the first phalanx, near their palmar aspect; we have also shown that those tendinous fibres which run along the radial side of the dorsum of the finger belong almost exclusively to the lumbricalis; this fact is established beyond doubt. It is an easy thing to demonstrate the existence of the direct fibres described above, on the cadaver. For this purpose we have detached from the fingers the tendon of the long extensor, together with all its appendages derived from the tendons of the interossei and lumbricales; and we have studied the course of these tendons on the palmar surface of the aponeurosis formed by their expansion, that surface, namely, which is applied to the bone; viewed from that side these fibres can be followed with very much less difficulty.

Although the tendency is increasing to-day amongst prominent anatomists to ascribe to the interossei, and especially to the dorsal interosseous muscles, the principal rôle in the act of extension which takes place between the

1st and the 2d phalanx, and between this and the 3d one, we shall endeavor to establish, in the physiological portion of this study, the part which is played by the lumbricales in the accomplishment of the various movements of the fingers, and to prove that these muscles are by far more important for the act of extending the two last phalanges of the fingers than the dorsal interossei.

Physiology.—The use of these small but very important muscles is still imperfectly known to the majority of practitioners; yet, according to Sappey,[1] their physiology was known to that eminent anatomist, Fallopius, who gave a pretty concise description of their actions as far back as 1561! Other anatomists not less eminent, as Winslow, Sabatier, Gavard, Boyer, etc., etc., according to the same author, held the same views up to the middle of the last century. It appears that Courcelles and Albinius[2] were also acquainted with the actions of these muscles, for in their anatomical diagrams they have represented the tendon of the lumbricalis as joining that of the extensor communis, which it follows to the end of the finger. John and Charles Bell[3] (who wrote at a time much nearer us) say, in speaking of the lumbricales: "They bend the 1st joint and extend the 2d; they perform alternately either office; when the extensors act, they assist them by extending the 2d phalanx or joint; when the flexors act, and keep the 1st and 2d joints bended, the extending effect of these smaller muscles is prevented, and all their contraction must be directed so as to affect the 1st joint only, which they then bend." Jamain[4] says that Theile considered them as flexors; and, according to

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[1] *Loc. cit.*, p. 361.

[2] "Recueil de planches pour la nouvelle édition du dictionnaire raisonné des sciences," etc., etc., t. ii, à Lausanne et à Berne, 1780.

[3] "The Anatomy and Physiology of the Human Body," v, American edition, N. Y., 1827.

[4] "Nouveau traité élémentaire d' anatomie descriptive," t. i, Paris, 1871, 696.

Sappey,[1] Prof. Parise, of Lille, who first called his attention to the works of Fallopius on this subject in 1847, has demonstrated, by pulling on the tendons of these muscles, that they extend the two last phalanges, flex the 1st phalanx, and adduct the four fingers toward their radial side at the same time that they rotate them slightly. But it is important to note here that Prof. Parise, like the other anatomists, makes these muscles act by the aid of the tendons of the extensor digitorum. Vesalius considered them as adductors (*musculi quatuor digitos pollici adducentes*); Spigel, as flexors of the first phalanx (*flectentes primum internodium*). Cruveilhier,[2] from whose work we have quoted, says: "I regard them, 1st, with Spigel, as *flexors of the first phalanx;* 2d, with Riolan, as specially intended to maintain the tendons of the extensors applied against the phalanges, and to act as a sheath proper to them; 3d, as *extensors of the two last phalanges* upon the first, an action which they share with the interossei muscles; 4th, as adductors and abductors; 5th, besides, they serve as a means of connection between the tendons of the extensors and those of the flexor profundus, and prevent the displacement of these last, as well as that of the first." Gray,[3] while speaking of the action of those muscles, says: "The action of the lumbricales and internal or dorsal interossei is said by Hunter to be to flex the first phalanges and extend the last two" (Works, by Palmar, iv, 237); and Cleland supports this (*Journ. of Anat. and Phys.*, old series, i, 85).

Duchenne[4] (de Boulogne), who had been trying of late to review and develop the ideas already broached by the ancients, and to whom we owe so much for our present knowledge of electro-therapeutics, had arrived at the conclusion that the lumbricales have for their function: 1, the exten-

[1] "Traité d'anatomie descriptive," t. i, Paris, 1847, p. 269.
[2] *Loc. cit.*, page 696. [3] *Loc. cit.*, page 425. [4] *Loc. cit.*, page 780.

sion of the two last phalanges; and 2, the flexion of the first one; also that they have no power whatever upon the lateral movements of the fingers. But depending upon the results he had obtained from his pathological as well as from his electro-muscular investigations, he insisted upon the fact that the powers of extension as well as flexion that he had granted to the lumbricales were only auxiliary movements to those developed by the action of the interosseous muscles. He considered that, physiologically speaking, not only are the interosseous muscles the only ones capable of performing flexion of the first phalanges, but also the only muscles having the power to extend the two last ones. Notwithstanding the shortness and incompleteness of the historical facts bearing upon the anatomical and physiological study of these muscles, we consider them sufficient for our purpose, which is simply to show how different are the views of different authors on this subject, and at the same time to point out that those writers who regard them as extensors of the last phalanges and as flexors of the first ones, have mentioned them incidentally as being accessory muscles to the interossei and specially to the dorsal interosseous muscles. Our own investigations, however, both anatomical and electro-physiological, have acquainted us with the fact that this generally admitted idea is wholly inadmissible, both in an anatomical as well as in an electro-physiological point of view. We have only to recall what we have said of the dorsal interosseous muscles on the one hand, and of the lumbricales on the other, to show that the reasons which have been brought forward, by different authors, in favor of the assumed power of extension of the dorsal interossei over the two last phalanges, fall to the ground; on the other hand, if we consider the position of the lumbricales, their direction, and the distribution of their tendons, it becomes impossible for us not to recognize 1, that they are

the true extensors of the two last phalanges; 2, that they are flexors of the first phalanx of the finger; 3, that they are abductors and adductors; and 4, that they also rotate the fingers from within outward. All these actions we have been able to verify on the living as well as on the dead subject. For this purpose we have dissected these muscles in the palm of the hand, leaving the fingers untouched; when they had been well isolated and freed from all the surrounding tissues, contrarily to the investigators who preceded us, we have tied a string around the belly of the muscle itself, and not to its tendon, as has been improperly done before. After these preliminaries we were able to study the effects produced on the fingers, placed in various positions, by pulling on the belly of the muscle in the direction of its long axis, either by means of the string or by using the dissecting forceps. In this way we determined: 1, that the three phalanges being extended on a line with their metacarpal bone, and the hand being placed on its dorsal aspect, pulling of the corresponding lumbricalis will either abduct or adduct, according to whether it be the 1st or 2d, or the 3d or 4th upon which the experiment is directed (for we must not forget that we have admitted elsewhere, that all the lateral movements taking place in the fingers, and tending to bring them to an imaginary axis passing through the middle of the hand, and through the medius, will be considered as adduction, while the opposite movement will be considered as abduction.) To avoid ambiguity in the description of these movements, let us take the first lumbricalis, for example; the tendon of which is distributed to the radial side of the index finger. Pulling on the belly of the first lumbricalis, the hand and fingers being placed as above described, produces abduction, and at the same time flexion and very slight rotation, of the first phalanx of the index finger upon its metacarpal bone, the two last phalanges re-

maining extended ; if, while in this position, traction upon the muscle is continued, it will be noticed that upon trying to flex the two last phalanges, which are now quite extended, a great deal of resistance will be experienced, and if, by multiplying the amount of force used, the two last phalanges are made to bend on their palmar surface, it will be noticed that by letting them go suddenly, they will spring back to their former position, *i. e.*, to a position of extension. 2. If, the first phalanx being flexed as above, we stop the traction exerted upon the belly of the first lumbricalis, we notice that the two last phalanges are also relaxed, and that they have a tendency to assume a position directly opposed to the one they had taken when we were acting upon the lumbricalis by traction, *i. e.*, they have a tendency to flex, the second upon the first, and the third upon the second phalanx, while the first phalanx has a tendency to return to the extended position. Now, if we flex the three phalanges of the index finger, the ones upon the others, so as to make the finger assume the position that it occupies when the hand is naturally closed, it will be seen that pulling of the string tied to the belly of the first lumbricalis will be immediately followed by extension of the two last phalanges, while the latter will remain flexed. 3. If the first phalanx of the index finger be extended and the two last ones flexed, pulling of the muscle will be followed by flexion of the first phalanx upon its metacarpal bone, while the two others will immediately be extended. 4. If the first phalanx be extended and pinned on a board, so as to prevent it from moving, and traction be exerted upon the corresponding lumbricalis, the two last phalanges will be extended, the third on the second, and the second on the first. Not only all these movements can be reproduced in the fingers after they have been dissected, but also, it then becomes easy to see how the tendon of their lumbricalis gets tense under

traction of this muscle, while the two last phalanges are being extended.

The foregoing facts are, doubtless, of some importance in determining the actions of the small muscles of the hand, *post mortem*; still, we are not disposed to look upon them, with those who have preceded us in the physiological study of these muscles, as conclusive, for the reason that on the dead subject upon which our investigations are made there always exist some inevitable causes of error. For example, the state of more or less advanced disorganization in which the various tissues are, causing a greater relaxation of these tissues, may suffice, by itself, to give results which are not in accordance with the physiological actions of these muscles. Besides, the various vessels and nerves which are distributed to the fingers may also prove to be a source of error, by being pulled in one or another direction; thus, we have been able to produce either extension or flexion of the fingers by simply pulling on the nervous filaments which are distributed to them, and this same result may be obtained by pulling on the connective tissue which surrounds them. Hence, we cannot be too careful, in dissecting the muscles of the fingers, to thoroughly separate their tendons from the surrounding tissues, so as to be sure to act through them only in our researches.

But as a means of counteracting these mistakes as far as possible, and following, in this circumstance, the example of Duchenne (de Boulogne), we attach more importance to our electro-muscular investigations upon the living body than to those which we have instituted upon the dead muscles. Perhaps it may be well to recall here, that Sappey does not admit of this mode of investigation, claiming that it is impossible to restrain the electrical current so as to obtain independent action of the muscles. According to this author, the results obtained by electrizing the muscles

are complex, being due to the contraction of several and different muscles at the same time.

This view may hold good, to a certain extent, in the case, for example, where the current is made to pass through certain regions of the body, where the muscles overlie each other in thin layers, and when the current used is not of the proper strength. But for other regions, as for that occupied by the dorsal interossei, or by the lumbricales in the palm of the hand, daily practice has taught us that it is comparatively easy to get the independent reaction of the muscle to which the current is applied through the skin. We may even go further and state that, in our hands, the electro-muscular investigations have proven more useful than the pulling, in the case of the dorsal interossei, as well as in the case of the lumbricales. Nevertheless, we must admit that it is less easy to obtain the isolated contraction of these latter by passing a current through them.

To obtain unequivocal and isolated reactions of the dorsal interossei in the living body, we must submit to several indispensable precautions: 1st, we must select with discretion the muscle upon which we propose to act, and the elective points upon which to place our electrodes; 2d, the electrodes and conductors must be well chosen—for our purpose, we have used very small, either olive or T-shaped-electrodes; 3d, the current used, of whatever production, must be of the proper strength, *i. e.*, it must be just strong enough to produce a certain amount of reaction in the muscle acted upon.

As we have said already, these are indispensable precautions to be always kept in view in all sorts of electro-muscular explorations; for without them, it becomes impossible to draw any positive conclusion from such experiments. We are aware that it has been recommended, in

such cases, to place one electrode in the palm of the hand, and the other on its dorsum. We can easily see what must be the result in electrizing the muscles of the hand in this way: the electrodes being placed in the best position to favorize the diffusion of the current, all the muscles must be excited at the same time; hence the various movements observed in all the fingers at the same time.

On the other hand, placing one electrode on the nerve and the other on the muscles must be followed by the same result, for most of the small muscles of the hand are supplied by the same nerve.

In our own investigations we have been in the habit of applying both electrodes on the muscle itself upon which the experiment is directed. In the case of the first lumbricalis, for example, which runs just on the outer side of the semicircular line passing from the wrist above to the root of the index finger below, and thus forming the internal limit of the thenar eminence, the electrodes, which are very small, and of the shape recommended above, are placed on a level corresponding with the middle of this line, just on its outer side, and about one or two cm. apart; this being done, and an induction battery being used, the current is so graduated as to produce reaction of this muscle only; for this purpose, it is better to begin with a weak current, which should be rapidly increased to the required strength. As soon as this point has been reached, the two last phalanges of the index finger having been kept in a semi-flexed position, they will be seen to extend and remain so as long as the current continues to pass through the muscle, while the first phalanx of the same finger will be flexed on its metacarpal bone, in such a way that the whole finger will assume a direction almost perpendicular to the metacarpal bone. We have repeated this experiment many times, with always the same result.

To produce contraction of the second lumbricalis, the electrodes should be placed on a corresponding level on the inner side of the same line; it will be found that here also the result of electrization will be the same as in the first case, *i. e.*, extension of the two last phalanges, with flexion of the first one, together with slight rotation from without inward, of the finger experimented on.

This experiment becomes much more difficult when we try to repeat it on the third and fourth lumbricales; here, on account of the diffusion of the current, we are more apt to get contraction of other muscles, specially of those forming the hypothenar eminence, so that the result obtained is not always conclusive; nevertheless, we have been able on several occasions to obtain isolated action of these muscles, which resemble in every respect those described above, as being the result of electrizing the first and second lumbricales.

But even if it were impossible for us to obtain isolated contraction of the two last lumbricales, we should consider it a matter of secondary importance; for the unequivocal and constant result obtained in the case of the two first ones would suffice, in itself, to prove that these muscles are extensors of the two last phalanges of the fingers *par excellence*, while on the contrary their power as flexors of the first one is but accessory to the dorsal interossei.

The mechanism through which these muscles act on the two last phalanges may be compared, to a certain extent, to that of a lever of the first kind, in which the resistance, situated at one extremity, is represented by the two last phalanges; the fulcrum, placed between the resistance and the power, is represented by the head of the first phalanx; and the power, by the tendon of the muscle. In the case of the first phalanx, the power producing its flexion may be represented as passing through a single fixed pulley situated at the radial side of the metacarpo-phalangeal articulation.

We do not agree with Sappey, who, when speaking of these muscles, says: "Those muscles flex the first phalanx of the fingers, and extend the two last ones. They perform this movement of extension by a mechanism without analogy in the economy: on the one hand, by appropriating the lateral part of the tendon of the extensors so as to act directly on the second and third phalanges; on the other, by drawing down, *i. e.*, by relaxing, the tendons of the flexors." We have said, already, that these muscles do not act through the tendon of the long extensors, but by means of a tendon which starts directly from them, and, consequently, is their own. Besides, it is not necessary at all that the tendons of the flexors should be relaxed, to allow the lumbricales to act upon the two last phalanges, as we have seen that the extension still takes place, even when the first phalanges are kept well extended.

PALMAR INTEROSSEOUS MUSCLES.

Anatomy.—With the majority of anatomists we shall admit the existence of three palmar interossei. As their name indicates, these small triangular muscles are placed near the anterior surface of the hand, and extend from the lower three fourths of the metacarpal bone, from which they arise, to the interdigital space, where they end in a tendon.

The first palmar interosseous muscle arises from the lower three fourths of the ulnar surface of the second metacarpal bone; the second and third arise, respectively, from the lower three fourths of the radial surface of the fourth and fifth metacarpal bones. Their direction is directly downward and slightly forward to the interdigital spaces, where they terminate in a tendon which behaves very much like that of the lumbricales; *i. e.*, the tendon spreads out widely, and sends three sets of tendinous fibres: 1st, one superior to the back of the metacarpo-phalangeal articula-

tion, and which in the case of the index finger, for example, decussate with similar fibres coming from the lumbricalis and dorsal interosseous situated on the radial side of this finger; 2d, a median set which go to the back of the first phalanx and to the base of the second one, into which they are inserted; 3d, a lower or direct set of fibres which pass directly along the side of the dorsal aspect of the finger to the base of the third phalanx, into which they are inserted.

From this mode of arrangement of the tendon of the palmar interosseous muscles, and that of the tendon of the lumbricales, a triangular space is formed on each side of the finger, of which the sides are formed, behind by the tendon of the long extensors, in front by that of a lumbricalis or of a palmar interosseous. The base of this space is toward the metacarpo-phalangeal articulation, and its apex toward the head of the first phalanx. The interval between the two sides of this triangle is filled up by tendinous fibres coming from the lumbricales on the one hand, and from both the dorsal and palmar interosseous muscles, on the other. It is principally through this triangle that the lumbricales and palmar interossei act to flex the first phalanges. The tendon of the third dorsal interosseous muscle, we have said, does not terminate in the same way as that of the other muscles of this group; it is very easy to verify, upon a dissection, that the tendon of this muscle does not end at the base of the first phalanx, like those of the other dorsal interossei; but, after reaching the ulnar side of the third metacarpo-phalangeal articulation, follows exactly the same law as the tendons of the lumbricales and palmar interossei; and for that reason we had postponed speaking of this muscle up to the present time. Having found that its action is exactly the same as that of the palmar interossei, we propose now to study and discuss their physiology together.

Physiology.—The modes of investigation used in determining the action of these muscles having been, in all respects, similar to those described above and used in the case of the other muscles, we shall not repeat them here. It will suffice to state, that on the dead subject, after the muscles and their tendons had been properly prepared, we have been able to ascertain that they are essentially extensors of the two last phalanges of the fingers; besides, they also flex the first phalanx; but this, like their associates, the lumbricales, they perform in a secondary manner; the true flexors of the first phalanx, as stated above, being the dorsal interossei.

As regards the 3d dorsal interosseous muscle, we have seen that the insertion of its tendon is, in all essential particulars, similar to that of the palmar interossei; from this fact we might have inferred that its action is also similar to that of these muscles. The results of our dissections and electro-muscular investigations seem to speak in favor of this view.

It is interesting to study the difference between the action of the 2d and 3d dorsal interossei. If a faradic current is made to pass through the former of these two muscles, it will be noticed that its contraction is followed by flexion of the 1st phalanx at the same time that the middle finger is abducted toward the radial side of the hand, and slightly rotated from within outward.

In the case of the 3d muscle, however, not only do these three movements take place, as in the case of the 2d dorsal interosseous, but also an unmistakable movement of extension is manifested in the 2d and 3d phalanges.

Not to omit any of the results we have obtained in our researches upon the small muscles of the hand, we should mention that sometimes we have noticed that the fourth dorsal interosseous had a slight power of extension over

the two last phalanges of the ring finger; but this is only of occasional occurrence, and consequently is of secondary importance.

From what has been established in this paper we might conclude:

1st. That the dorsal interossei are the principal flexors and abductors of the first phalanx of the fingers, and that they are also in a slight degree rotators. That they perform these functions independently of the long flexors and the other small muscles of the hand.

2d. That the palmar interossei, the lumbricales, and the 3d dorsal interosseous are the extensors of the two last phalanges, *par excellence.*

3d. That the three palmar interossei and the 3d and 4th lumbricales are adductors, while at the same time they rotate the fingers into which they are inserted; the 1st and 2d lumbricales being abductors.

4th. That all the palmar interossei and the lumbricales are flexors of the first phalanges of the fingers; but that they accomplish this action only when these phalanges are already semi-flexed by the dorsal interossei.

5th. That in some rare instances, the 4th dorsal interosseous muscle acts as an extensor of the two last phalanges of the ring finger, being in this case accessory to the 3d lumbricalis.

(*To be continued.*)

Owing to the pressure of original material, the Editorial and an interesting article by Dr. Grace Peckham on Rhythmical Myoclonus have been crowded out of this number.—Editor.

NEW BOOKS AND INSTRUMENTS.

Transactions of the American Gynecological Society. Vol. vi, for the year 1881. Philadelphia: Henry C. Lea's Son & Co., 1882.

This volume, as it comes to us each successive year, must needs be of superlative value to compensate for its tardiness of publication. As a matter of fact, the world at large has made itself familiar with much of its material as reported in the medical periodicals at the time of the meeting of the Society, and it is, therefore, rather as a keepsake that one welcomes the present beautiful book, though besides the valuable papers which one thus becomes possessor of, this volume, as well as its predecessors, contains a most complete index of gynecological and obstetrical literature. In the present instance it brings us to the close of 1880.

Dr. W. H. Byford, of Chicago, in his annual address, as president, after congratulating the Society upon the amount of work done, and the high position it has attained to, making it "the authoritative exponent of advanced gynecology on this side the Atlantic," directs the attention of the members to the subject of perpetuating the memory of Ephraim McDowell by creating a fund, the interest of which shall be devoted to prize lectures or essays upon chosen subjects of gynecology. The method suggested, of each ovariotomist contributing a portion of his fee, does not seem to have met with a ready response so far, I believe, no one having laid the foundation of the fund.

That the tribute paid McDowell by Prof. Byford is most merited, certainly no one will deny, and it is equally certain that all gynecologists, and, in fact, all American surgeons, will for all time honor the name of him who first dared do ovariotomy.

1. The first paper we find in the book is contributed by Dr.

Samuel C. Busey, of Washington, D. C., and is entitled "Acute hyperæsthesia of the peritoneum, either circumscribed or diffused, following minor gynecological operations and manipulations." The paper is based on the report of a case of dysmenorrhœa, due mainly to anteflexion of the womb, in which Dr. Busey had introduced a laminaria tent. Most alarming symptoms were speedily developed, and the tent being removed seemed to put an end to the trouble. Dr. Busey discusses the question whether the symptoms produced were not those of a neurosis rather than of a beginning inflammation. We might reasonably look for the latter when using a straight laminaria tent in a case of anteflexion.

2. The next paper in order is on "Exploratory puncture of the abdomen," by Henry J. Garrigues, M.D., of New York, and is, to our mind, one of the best contributions to the Transactions. It gives evidence of great labor and patience on the part of the author, and is very valuable as an original study. Dr. Garrigues has made an examination of ninety-four specimens of fluid, mostly ovarian, and from other abdominal tumors. These he compares in their physical, chemical, and microscopical aspects, in order to determine how far this kind of examination might serve for diagnosis. One of the most important points in the paper is the author's dissension from the view held by Drysdale as to there being a pathognomonic ovarian corpuscle, the same which John Hughes Bennett described in 1852. This he holds not to be a cell at all, but the nucleus of an epithelial cell which is undergoing a fatty change, and he considers it without any value as a means of diagnosis. Dr. Garrigues' studies lead him to advocate tapping in every case of abdominal cyst before a more dangerous operation is undertaken.

3. The third paper in the volume is contributed by Dr. G. H. Lyman, of Boston, and is entitled "Notes on cases of pelvic effusion resulting in abscess." Those of us who have the largest opportunities cannot too often insist upon the importance of early recognizing these effusions, and for that reason Dr. Lyman's paper is a most useful one. He makes a good point of the early resort to trocar and aspirator as soon as there is evidence of the presence of pus.

4. Then follows a paper which bears as title "Genital renovation by kolpostenotomy and kolpsecpetasis in urinary and fæcal fistules," by Nathan Bozeman, M.D., of New York. Dr. Bozeman advocates his plan of restoring the vagina to its natural dimensions by dividing all cicatricial bands, and by gradually distending

it in those cases of fistulæ which are very difficult of access, in opposition to the old method, practised first by Vidal de Cassis, later by Jobert (de Lamballē), and yet more recently by the late Prof. Simon, of Heidelberg, viz., that of closing the vaginal outlet.

5. "Forcible elongation of pelvic adhesions," by Ely Van de Warker, M.D., of Syracuse, N. Y. The cases (four) in which Dr. Van de Warker has had opportunity to put his views in practice are scarcely sufficient, one would suppose, to make even the originator enthusiastic over so novel a procedure; and it is certainly too diametrically opposed to all accepted notions of what is due inflammatory products in the female pelvis to meet with a hearty welcome from his compeers.

6. A paper by Dr. Isaac E. Taylor, of New York, follows on "Lupus or esthiomène of the vulvo-anal region." He does not claim to bring forward any thing specially new either in pathology or treatment. After removal of such growths it appears Dr. Taylor's custom is to have an open wound, brushing it over, however, with the brown- red-heated cautery. Another method which has proved very satisfactory in other hands is, after having, by the aid of scissors, thoroughly removed the growth, considering now more specially the lupus prominens, to bring the edges of the healthy skin together by interrupted sutures, and secure primary union. We thus avoid a continuance of the sore, also granulations and cicatricial tissue, which latter is sometimes liable to take on the old growth.

7. "Bursting cysts of the abdominal cavity," by William Goodell, A.M., M.D., of Philadelphia, is the paper next in order. Dr. Goodell holds that the cysts that burst and oftentimes refill are not of the ovary but of the parovarium. He is also of opinion that the operators who have had double ovariotomy followed by undisturbed menstruation have mistaken, on one side at any rate, a parovarian for an ovarian cyst, and have not removed the corresponding ovary at all, or else we must hold to the presence in these cases of a third ovary. Considering that many observations now point to menstruation being solely dependent on the Fallopian tubes (Tait), this argument will not hold good.

8. Dr. H. F. Campbell, of Augusta, Ga., contributes a paper on "Erysipelas in childbed, without puerperal peritonitis." He is inclined to attribute the immunity in part to tolerably intense cinchonism maintained throughout the lying-in time.

9. A clinical paper by T. Gaillard Thomas, M.D., of New

York, entitled "Expansion of the bladder over the surface of abdominal tumors, and its attachment to them or to the abdominal walls as a complication of laparotomy." He considers the diagnosis impossible until the abdomen is opened, and as to treatment, if the bladder has been divided either intentionally or by accident, he holds that it should be caught up in the abdominal wound, rather than sutured and returned.

10. Another clinical paper is that of Thaddeus A. Beamy, M.D., of Cincinnati, Ohio, "Fibroid polypus with partial inversion of the uterus, with specimen." The inversion occurred at the time of the operation, and fortunately the chain of the écraseur broke, or the patient's life might have been lost. Dr. Beamy finally cut the growth in sections and removed it.

11. Albert H. Smith, M.D., of Philadelphia, contributes a paper on "Axis traction with the obstetric forceps," in which he argues that the older instruments, more particularly the Davis forceps, can perform the true "axis traction" much more exactly than can the Tarnier forceps, and with much more safety.

12. "Measurements of the uterine cavity in childbed," by Dr. A. D. Sinclair, of Boston, and (13) "Jaundice in pregnancy," by Dr. J. W. Underhill, of Cincinnati, are the titles of the two next papers.

14. The Transactions close with "The practice of gynecology in ancient times," by Edward W. Jenks, M.D. LL.D., Chicago, Ill., a very elaborate and entertaining summary of the subject taken at random from the old writers. The volume further contains the several papers offered by the candidates elected to Fellowship.

On the whole, though there are several contributions of great merit and interest in the collection now before us, yet the majority fail to reach the high order of excellence we feel justified in looking for from so distinguished a body of men as compose the Society. In the matter of publishing the work, Henry C. Lea's Son & Co. have evidently felt that nothing could be too good; paper, print, and binding are all of the best.

[B. M'E. E.]

ORIGINAL OBSERVATIONS.

HYSTERICAL LOCOMOTOR ATAXIA.

By M. PUTNAM JACOBI, M.D.

Ellen R., an Irish woman, aged thirty-five years, consulted me first in the spring of 1878. She was a widow, and had had one child fifteen years previous to the time of my seeing her. She stated that her father had been insane for twenty-five years, and during the time that the patient was under observation, a brother became also insane, and remained so.

The patient, a cook by profession, was a woman of sufficiently robust build, who claimed to have been in good health, not only before, but for several years after, her confinement. During seven years, however, her health had been impaired.

The first symptoms of ill-health pointed to uterine disturbance: leucorrhea, to which the patient paid little attention; and vesical tenesmus and pain at micturition, which often were quite distressing. Not until several years later did she experience any pain about the pelvic region; and then it was moderate and inconstant. More frequently she suffered from pains in the thighs, and more especially from numbness in the same region. Menstruation was regular and painless, but too profuse.

Nervous symptoms, however, of manifold character, soon appeared, and masked those of local significance. The first onset of these consisted in an attack, which she described as a "fright," coming on as she was about to take some medicine for the vesical tenesmus. Apparently there must have been a spasm of the œsophagus, for she fancied she was about to have hydrophobia. It was accompanied by vertigo, diffused numbness and prickling throughout the body, and a feeling as though she would fall forward. These symptoms passed away after a few hours, but the

patient remained so weak that she was unable to walk for several months. During this period of idleness she was subject to fits of weeping without cause.

It was three years later, and several months before she consulted me, that the disturbances of motility, which henceforth became so prominent, began. The patient first experienced difficulty in going up and down stairs; then, in rising to her feet from a kneeling posture; finally, her gait in walking became extremely unsteady—she swayed from side to side as she progressed, and often tried to support herself by surrounding objects; the numbness in the limbs increased, but there was no pain.

It was for this difficulty of locomotion that the patient consulted me. On the first, and somewhat hurried, visit, I found that the uterus was slightly enlarged—the sound passing to a depth of eight centimetres,—and considerably prolapsed. I inserted a cup-and-stem pessary, and showed the patient how to adjust it. This instrument effected so great an improvement in her power of locomotion and of rising from the ground, that she ceased to visit me, and further examination of her case was thus postponed.

The improvement lasted two or three months, but then ceased; the difficulty of walking returned and increased; patient grew weak and was obliged to give up work. During the summer and fall of this year she entered successively three hospitals—the Homœopathic, St. Luke's, and the Presbyterian. In both the latter a positive diagnosis was made of locomotor ataxia,—diagnosis subsequently defended with earnestness in a personal conversation I had an opportunity of holding with one of the physicians who made it. This fact is mentioned as showing the deceptive character of the symptoms in question.

I next saw Ellen R. in Jan., 1879, after an interval of six months. I found the difficulty of locomotion so much increased that the patient was obliged to use a cane in walking. The gait was uncertain and staggering; the arm not employed with the cane, oscillating, the body being inclined forward. She would walk at first slowly, then hurriedly; the foot was thrust incoherently forward in different directions and then brought suddenly down to the ground. It was this element of the gait which seemed most distinctively ataxic. The uncertainty of gait was increased by closing the eyes, and the patient could then with difficulty maintain her equilibrium. In this position, however, she resisted efficiently, firm downward pressure upon the shoulders. Recumbent, all movements of the limbs could be executed; the ataxia disap-

peared. This was an important difference from the symptoms of tabes dorsalis.

At this date there was no disturbance of sensibility in the limbs—neither pain nor anæsthesia. There was, however, a sense of constriction in the abdomen, extending toward the epigastrium, but not around the back. There was also complete absence of the patellar tendon reflex. One sensitive point existed in the cervical spine. Faradic contractility was intact. The patient was slightly deaf in the right ear, and complained of impairment of vision of right eye, where, indeed, the optic nerve was partly atrophied. This circumstance had been recognized in the hospitals, and considered confirmatory of the diagnosis of locomotor ataxia. But there had been a mechanical injury to the eye, and closer examination showed that this was the cause of the impairment of vision.

During the last six months the patient had had several attacks of dysphagia, such as had ushered in her entire illness, but much more severe. In addition, she had become subject to violent attacks of dyspnœa, with alarming sense of suffocation. The voice had become habitually affected; words were uttered spasmodically, the patient frequently catching her breath while she spoke, and usually terminating her sentence in a whisper.

The patient had abandoned the use of the pessary, because she had had pain from it. The uterus was somewhat prolapsed,—though less so than formerly—heavy, and congested. Much endocervicitis existed, and it was now observed that the cervix was lacerated.

The patient was taken into the New York Infirmary, the endocervicitis treated with carbolic acid and glycerine, and prolonged galvanic applications made to the spine. Under this treatment, with rest and good food, she improved greatly. By the middle of March she was able to walk a considerable distance. In April the pessary was reapplied, and faradization of the limbs substituted for galvanization of the spine. In July the patient left the infirmary, and immediately began to feel worse.

I saw her again in September, 1879. The ataxic gait had returned. In addition, the patient suffered from pains shooting across loins, then from hip to ankle, "as if it darted all through." The pains simulated the fulgurating pains of locomotor ataxia, but the "stabbing" pains, on whose diagnostic value Seguin has laid much stress, were absent. The patient had a cotton-wool feeling under the sole of the feet, principally the great toe. As before, the tendon reflex was entirely absent.

I still, however, persisted in the diagnosis I had made, of hysterical ataxia, primarily induced by uterine disease ; and explained the relapse by the existence of the laceration of the cervix. This caused few or no symptoms while the patient was at rest, and while the endocervicitis was being treated ; but became an efficient cause of irritation when the patient resumed work, walking, standing, etc.

Toward the end of October I operated on the cervix, with complete success ; at the end of two months the uterus was normal in size and weight, kept in position ; the cervix perfectly healthy.

At this time the patient "felt much steadier on her legs." The ataxia and shooting pains disappeared, though there was still some swaying of the body while the patient walked. Facility of going up and down stairs has greatly increased.

Throughout the winter, the patient having returned to service, her health remained only passably good. She was weak ; suffered from pains in hips and legs ; occasional cramps or patches of rigidity on inside of foot or outside of thigh. In March of 1880, patient began to suffer from twitching in left leg at night, and both limbs began to be markedly paretic. The paresis was manifest even in the recumbent position ; the limb was lifted or moved in a lateral direction, sluggishly and with a sense of great effort.

The patient always felt worse in the morning ; at first could hardly move, but having been on feet some time, could stand or walk pretty well ; always improved by application of faradic current to limbs. After a few minutes' application, much stronger contractions were obtained with the same strength of current.

As six months had now elapsed since the operation and the removal of all uterine lesion, I began, for the first time, to fear that after all some form of chronic sclerosis of the cord existed, more probably lateral than posterior. Several symptoms were, however, lacking, but the recent occurrence of "cramps" seemed to herald the development of the rigid contractures and of the tremors characteristic of lateral sclerosis.

At this time the patient ceased attendance. She continued to grow worse ; could not get up and down stairs ; had shooting pains all over her body ; lost flesh and appetite. Finally, she went out West (in August, 1880), travelled a good deal, remaining in service at different places according as her health would allow ; had several attacks of chills and fever, and of "congestion of the liver." But in the midst of these febrile disorders, and perhaps because of them (?), the hysterical symptoms gradually sub-

sided. In September, 1882, she returned to New York, and came to see me. I found her entirely free from all her former troubles, only a very slight swaying of the gait recalled the paresis and ataxia of former times; she could go up and down stairs, rise from her knees, etc., without difficulty.

Coincidently, the aphonia, dysphagia, and dyspnœa had disappeared; the patient suffered from pains nowhere.

The tendon reflex, however, was still absent.

The diagnosis in this case rested upon:

1st. The marked modification of the symptoms determined by each modification of the uterine disease: in the first place by the use of the pessary; in the second, by treatment of the endocervicitis; in the third, by the operation on the lacerated cervix.

2d. The fact that ataxia of the lower extremities preceded all modifications of the sensibility. In tabes dorsalis some degree of anæsthesia (Rosenthal); of stabbing, or of fulgurating, pains (Seguin), always precedes any marked ataxia. It is conceivable that an hysterical anæsthesia should have existed in the case of Ellen R., and thus increased the difficulties of diagnosis, but it did not.

3d. The coincidence of paresis of the lower extremities, with or indeed out of proportion to the ataxia, as shown by the difficulty of rising from the knees, of going upstairs, etc.

4th. The absence of ataxic incoherence in the movements executed in a recumbent position.

5th. The absence of pupillary phenomena, bilateral atrophy of optic nerves, gastric attacks; the presence of paroxysmal dysphagia and dyspnœa, both predominantly hysteric phenomena; the limitation of constriction to the abdomen.

The diagnosis was, however, particularly obscured by:

1st. The existence at one time of pains a good deal resembling fulgurating pains.

2d. Of plantar anæsthesia, cotton-wool feeling under sole of foot. This, however, did not appear till late in the disease, and on close examination, seemed to be limited to the great toe.

3d. The persistent absence of the patellar tendon reflex.

4th. The recurrence of symptoms after removal of all peripheric irritation in the uterine system.

5th. The appearance of localized cramps and tremors in different parts of the lower limbs. On the whole, however, the diagnosis could be and was made out; and was confirmed by the result. But its difficulty is best shown by the fact that the contrary diag-

nosis was made in two hospitals, by most competent physicians, who, however, only had the patient under observation during a short space of time.

The mechanism of the production of such symptoms, by means of an irritation starting from the pelvis, is certainly very obscure. We must infer that the centripetal impressions arriving from the focus of irritation are distributed, on the one hand, to the posterior roots in the columns of Burdach ; on the other hand, to the lateral columns of the cord, in such a way as to produce respectively ataxia and loss of tendon reflex, as sclerosis of these same parts would have done. Since the early affection of sensibility in tabes dorsalis has been associated with the debut of the process in the columns of Goll, the absence of any sensory disturbance in the early history of our case becomes all the more important in excluding this portion of the cord from even functional disease, and thus in distinguishing the case from true locomotor ataxia.

The loss of tendon reflex—instead of the exaggeration of it, so often seen in hysteria—implies an inhibition of the motor impulses transmitted through the lateral columns,—the inhibition dependent on irritation of posterior nerve-roots from pelvic irritations. The inhibition constitutes a functional imitation of the effect which may be elsewhere produced through destruction of these same columns in organic disease. The ataxia and paresis must be similarly explained ; as also the attacks of muscular rigidity transiently observed. The discovery by Charcot of organic disease,—sclerosis of the lateral columns—in a case of hysterical contraction persisting till death, indicates the extent of possible affection of this part of the cord in hysteria.

A CASE OF HEPATIC ABSCESS.

By CHAS. H. KNIGHT, M.D.

For the opportunity of observing the following case I am indebted to the kindness of Dr. S. J. Clark.

The patient was a negro, of average height and weight, of previous good health, but for many years addicted to excess in liquor. He is said, on somewhat doubtful authority, in childhood, to have had "heart disease, which he outgrew." About twenty years ago he had a venereal sore, the history of which, however, does not suggest a syphilitic origin. He had no other serious illness, except "chills and fever" in 1865, until ten years ago, when he had

an attack of acute rheumatism, nearly all the large joints being involved. There is no history of cardiac complication at that time.

In August, 1880, the patient fell from a height of about ten feet, striking on his head and right shoulder. Beyond being stunned and bruised, he observed no serious effects, until about four weeks later he began to have obscure pains in the abdomen, and in the course of three or four months, he noticed a swelling in the right umbilical region. About this time, also, he had several attacks of "bilious" vomiting.

In Jan., 1881, about five months after the accident referred to, the abdominal pain and swelling and the consequent dyspnœa had reached such a degree that aspiration of the tumor was resorted to. At this time the area of hepatic dulness extended in the mammary line from the eighth intercostal space to three inches below the border of the ribs. In the right umbilical region there was a circumscribed mass as large as the clenched fist. On the right side, over the lower ribs, there were œdema, and some pain on pressure. The needle of the aspirator being inserted two and a half inches to the right of the umbilicus and three inches below the margin of the ribs, sixteen ounces of pus, tinged with blood, were withdrawn, the operation giving marked relief. In the evening there was a slight chill, pulse 96, temperature 100°. The pus withdrawn was thick and ropy, containing numerous shreds, but nothing resembling liver tissue.

Two weeks later, in consequence of a partial return of the swelling, aspiration was repeated at the same point, eight ounces of pus, less fluid than at the previous operation, being removed. Evening temperature, 100°; pulse, 98; no chill.

There was gradual improvement in the general condition for nearly a month, when signs of an abscess in the left lobe, as well as of recurrence of the original abscess, presented themselves. A third aspiration of the right abscess yielded only six ounces of pus, much thinner than at either of the preceding operations. From the abscess in the left lobe eight ounces of very thick pus were withdrawn. The relief of discomfort was immediate and complete. Evening temp., $99\frac{2}{5}°$; pulse, 120.

For four months the progress of the case was very satisfactory, the patient steadily improving in flesh and strength.

Early in June, 1881, without constitutional disturbance, the abdomen again began to enlarge, and, on examination, hepatic dulness was found to extend from the right nipple to five inches be-

low the margin of the ribs ; no circumscribed tumor being definable. The abdominal swelling rapidly increased, respiration became hurried and labored, and a condition of extreme exhaustion supervened. On the 16th of June a puncture with the aspirating needle was made two inches to the right of the median line, close to the border of the ribs, twenty-five ounces of thin pus being evacuated. Relief, however, was not complete. The patient steadily grew worse, signs of pulmonary complication developed, and for three days before death, which occurred June 24th, there was profuse purulent expectoration.

Throughout the course of the disease there was no icterus ; there were no chills, except on one occasion following the first aspiration ; and the temperature never rose above 100°. The bowels were always regular, and the character of the stools was in all respects natural. There were occasional attacks of dyspepsia. No urinary abnormalities were ever discovered.

In consequence of objection on the part of the family, the autopsy was somewhat hurried and superficial.

On opening the abdomen about a pint of ascitic fluid escaped. The liver was found to be adherent to the wall of the abdomen at the site of the punctures in the left lobe and over the entire upper surface of the right lobe. On breaking up the adhesions, an immense abscess was found on the upper surface of the right lobe, communicating by an opening, large enough to admit the finger, through the right crus of the diaphragm, with the lower lobe of the right lung. Its cavity was estimated to contain about forty ounces of pus. The walls of this abscess were very friable.

Below this abscess and connected with it by a minute aperture, was one of much smaller capacity, evidently the one emptied at the final aspiration on June 16th. It is improbable that an opening between the two abscesses had existed during life ; the thin partition might easily have been ruptured in the progress of the autopsy.

The weight of the liver was six pounds, twelve and a half ounces.

At the site of the aspirations in either lobe the adhesions were firmer than elsewhere, and the liver tissue was contracted around a fibrous cicatrix, representing an obliterated abscess cavity.

The gall-bladder was about half filled with healthy bile. The liver elsewhere was normal, and there was no disease of other abdominal viscera.

The heart presented no organic disease, and it is surmised that a murmur, heard at times during life, was due to interference with the cardiac function by external pressure.

The left lung was normal, except slight hypostatic congestion and a few pleuritic adhesions at its lower lobe. The right lung, except its upper lobe, was disorganized ; its lower lobe being firmly adherent to the diaphragm and being converted into a purulent mass, in which no normal lung tissue was recognizable.

In conclusion, it appears that a single aspiration sufficed to cure the abscess in the left lobe, while three were required to efface that in the right lobe. The duration of the large abscess, which was the cause of death, and which the aspirating needle did not reach, is conjectural, although its dimensions, the character of its contents and of its walls, and the strength of the adhesions between the liver and the diaphragm, indicated its probable existence from the beginning of hepatic symptoms.

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ARCHIVES OF MEDICINE.

Original Articles.

RHYTHMICAL MYOCLONUS.

By GRACE PECKHAM, M.D.,

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THE student of the neuroses will find in that mysterious realm of obscure affections to which the human race is liable, none more strange nor striking than the clonic hyperkineses. The motor force plays upon the muscles, and they respond, puppet-like, as if moved by strings. Automatically and rhythmically, irregularly, constantly, or at intervals, while waking or sleeping, or during both, the contractions take place in muscles physiologically or anatomically grouped, resulting in curious movements. If the victim has the mimic or histrionic spasm, he makes strange grimaces; if the masseter muscles are affected, his jaw moves backward and forward more or less regularly; if the disease invades the spinal accessory, he rotates his head from side to side, or nods like a mandarin. Sometimes the individual afflicted hops, jumps, or spins about, dances, or climbs, or performs other coördinate movements entirely against his will; indeed, with a persistency and regularity, and with a singular lack of fatigue, utterly impossible as the result of volition.

To these strange cases should be added that of Bertha B's. Not, perhaps, so weird and remarkable in its manifestation of the rhythmical clonic spasm as some, but none

the less unique, and offering in some respects conditions, which a diligent search through the medical literature on the subject shows, have very seldom, if ever, been observed.

Bertha B. is eleven years of age. She was next to the youngest in a family of eleven children, five of whom are living. Six died in early infancy ; none, however, of any nervous affection. Her father and mother have always been healthy ; though the latter is now a somewhat nervous woman, having grown more so of late, on account of the reverses which have overtaken the family. Except an attack of hysteria, which happened at one time to an older sister, there is no history of fits or nervous disorders of any kind. Bertha had always been well, until early last spring, when she had the feeling that every five minutes her right arm was pounded. This lasted for a week, after which, commenced in that member the peculiar clonic contractions which are about to be described. Two weeks after, the movements began in her right leg, and a week later in the left.

In June she presented herself at Dr. Anne A. Angell's Children's Clinic at the Mount Sinai Dispensary. She was then put upon the arsenical treatment on the supposition that possibly the movements were choreic in their nature. The number of contractions varied in the summer from seventy to a hundred and more per minute. They were not diminished by the arsenic, which was discontinued after several weeks' trial. She was then given tonics and sent to the country with a party of children, a beneficiary of the "Fresh-Air Fund." The change of scene and the pleasures enjoyed improved Bertha's general health, and the clonic spasms were less severe than they had been since they first commenced.

When she first came under my observations she had but shortly returned from this trip. The supinator longus muscle of the right arm was contracting vigorously, as was also the lower portion of the triceps. The muscles of the inner hamstring group of both legs were also contracting, though much less powerfully. Of these the gracilis was the muscle most responsive to the abnormal stimulus. Sometimes the sartorius was affected. Occasionally a wave has been seen to pass over the biceps, and at one time the anconeus partook in the rhythmical spasm, and was as clearly outlined as if it were dissected from its bed of neighboring muscles. The supinator longus of the right arm, which, if the

accounts of the child and the family are to be trusted, was the first muscle affected, was then as afterward the grand centre for the display of the disease. The whole belly of the muscle swelled during the contraction, and stood forth more conspicuously than were possible if it were contracted by the will or artificially by electricity. There was no muscle tone to be detected even by the stethoscope.

During sleep the affected muscles were quiescent. If the child were partially aroused, the supinator alone would contract, at first somewhat powerfully, then it would subside with a kind of oscillatory movement; if the arm were moved gently without disturbing the child's slumbers the muscle would contract slowly and rhythmically, the intensity gradually decreasing until the muscle was at rest. In the morning the contractions were more vigorous and rapid than when she retired.

Before any direct treatment was employed the clonic spasms were always rhythmical in their nature. Not absolutely, but so nearly so, that when looking at the supinator longus, it was not difficult to imagine that it was moved by the pulsations of a small and vigorous heart concealed in its interior. A physician, who first described the case to me, was so impressed with this appearance, and the contractions at the time an examination was made happening to coincide with the number of the beats of the heart, thought that possibly the clonic spasms were due to some pathological condition of the circulatory apparatus. Indeed, Romberg [1] cites a case of a woman who suffered from time to time with violent palpitations, which were accompanied by convulsive movements of the left arm, isochronous with the beats of the heart. As the palpitations subsided, the convulsive jerks subsided in the same proportion. The affection was relieved by acetum digitalis.

While the contractions of Bertha's muscles were rhythmical or nearly so, their intensity varied greatly at different examinations, and also at the same examination. This can be seen in the myograms.[2] Fig. 1 shows the character of the contractions before

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[1] Romberg's "Lehrbuch der Nervenkrankheiten," Bd. ii, p. 287.

[2] The myograms were taken by means of a Marey's tambour placed upon the muscle where the contraction caused the greatest excursion of the recording lever, which wrote upon a cylinder revolving at the rate of 18 mm. per second. The line below the myographic tracing marks the time, the intervals between the elevations indicating half seconds. For the myograms, as well as for other valuable assistance in making observations on the case, I am greatly indebted to Dr. R. W. Amidon.

treatment. Sometimes the supinator longus gave the dicrotic traces seen in fig. 2.

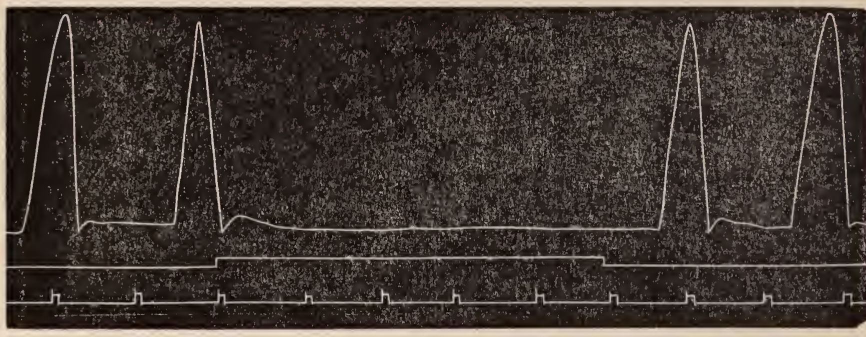

FIG. 1.

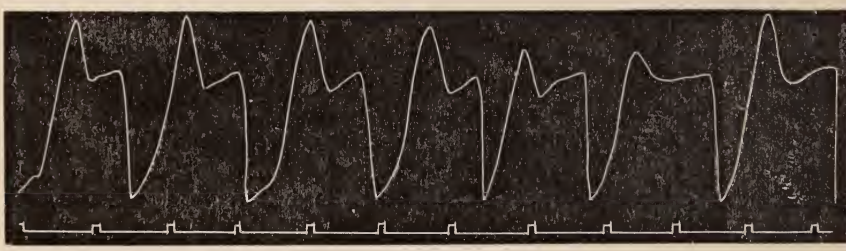

FIG. 2.

October 19, 1882, she was seen at the Manhattan Hospital by Drs. Seguin, Amidon, and Birdsall. Dr. Seguin made an electrical examination, and found that both the muscle and nerve of the right arm were more excitable than those of the left or unaffected side. Reactions were as follows :

Galvanism.

Left musculo-spiral nerve, cacc, 18 cells, > ancc.
Right musculo-spiral nerve, cacc, 18 cells, > ancc.
More reaction in right than in left.
Left supinator longus muscle, cacc, 14 cells, > ancc.
Right supinator longus muscle, cacc, 20 cells, = ancc.
Right contracted more powerfully with 20 cells than the left.

Faradism.

Both muscle and nerve of the right side, tested with the secondary current, coil at eighty centimetres, were more excitable than the left.

As will be seen there were no degeneration reactions. These results were confirmed in the main by subsequent examinations.

Shortly after this, Dr. Angell, knowing that I was making a special study of the neuroses of childhood, kindly gave the case to me for investigation.

The muscles which were affected were not increased in size; neither was there atrophy. Careful tests with the æsthesiometer showed that the sensibility was normal. The surface temperature, though showing some variation between the two sides, negatived the idea that there was increased production of heat from the muscular contractions, for where these were the most vigorous the temperature was lower. The cutaneous, patellar, and other reflexes were normal. The dynamometer recorded the same strength for both hands. The child, however, said she was not sure of her hold on whatever she was carrying, and was liable suddenly to drop things.

Hearing, taste, and smell were perfectly normal. Her eyes, though she had been troubled with chronic conjunctivitis, so far as seeing was concerned, were up to the usual standard. She had no color-blindness; the ophthalmoscope revealed a normal fundus.

A careful search for the pressure-points to which Remak calls attention, in the cervical region, as well as in other parts of the body, failed to reveal any such. Pressure in the ovarian regions, which exercises such an influence in cases of hysteria, was without effect on the spasm in this instance.

There was some tenderness of the spine, but it was not a constant symptom. Sometimes it was situated in the cervical region; sometimes in the dorsal.

Pressure on the right carotid, made firmly so as to prevent as nearly as possible any passage of the blood through the artery, caused the contractions of the opposite side to cease. When the pressure was taken off, they would recommence again with a bound, as if the nerve force which caused the contraction had been dammed up and had broken forth when the obstruction was removed. Pressure on the left carotid affected the opposite side in the same manner, but those muscles which were contracting on the same side on which the pressure was exerted, remained unaffected.

In the investigation of this case the pressing question has been: What is the cause of this excessive motor display?

According to certain German writers, fear plays an important rôle in the production of neuroses characterized by clonic spasms; hence they have sometimes been classed among the *Shreck-neuroses*.

Dahl[1] reports the case of a woman, thirty years of age, who, after a great mental shock, happening several days before, lost consciousness for ten minutes, after which she had shaking movements of the right forearm, which in two hours became exacerbating and remitting spasms, which continued in spite of narcotics. These were accompanied by great pain in the occipital region, which increased with the rapidity of the contraction. When there were exacerbations the right hand struck violently against the left shoulder. She could not hold the arm quiet. She was cured by faradism.

Remak[2] reports a case of a man twenty-two years old, who fell fifteen feet from a roof which he was thatching. He was not wounded, but became unconscious, after which there appeared in his extremities clonic muscular contractions.

Porter[3] in an article entitled "Anomalous Choreic Movements," reports a case of a soldier who deserted from the army, and suffered greatly from fear that he should be arrested as a deserter, as also from cold and fatigue. He had attacks of clonic spasms in different muscles of the body.

Galvagni[4] mentions the case of a man who, after a severe accident, had rhythmical contractions of his left forearm.

Dr. N. Friedrich,[5] of Heidelberg, narrates a case of clonic spasms of certain groups of muscles belonging to the extremities. He gives the disease the name of "Paramyoklonus Multiplex." He recognizes the extreme rarity of clonic spasms of the extremities, though he rather over-states it when he says he can place by its side, neither in literature nor his own experience, a like or even a *similar* case.

His patient was very much frightened by the bursting of a circular saw. He escaped uninjured, but fourteen days after, the clonic contractions began, preceded by a sensation of pain and

[1] *Jahresbericht der Med.*, 1872, vol. ii, p. 42.

[2] *Berliner klinische Wochenschrift*, 1865, p. 94.

[3] *American Journal of Medicine*, 1864, p. 140.

[4] *Rivista clinica di Bologna*, 1880.

[5] *Virchow's Arch. f. Path. Anat. und Phys. und f. klin. Med.*, p. 421, 1881.

pressure, which he felt only when at work. Possibly this sensation resembled that described by Bertha as the feeling of being pounded, which she experienced for a week before the outbreak of her malady. Clonic spasms occurred in a number of symmetrical muscles in the upper and lower extremities, which ceased during sleep and voluntary motion. They were always unrhythmical, varying greatly in time and intensity of contractions in different days and different times of the day. They contracted at the rate of forty to fifty per minute, ceasing occasionally for a quarter or a half an hour. They contracted more powerfully, and were more rapid when the patient was at rest. When he attempted to go to sleep they became so powerful that it was a long time before he could do so. When at last he slumbered they ceased entirely; but sometimes he would be awakened by a strong contraction, which would take place in both legs and travel upward to the trunk.

The contractions stopped on voluntary movements. There was no wavering when he closed his eyes; no loss of motor power; electrical and mechanical irritability were preserved, but the patellar and other reflexes were greatly increased.

It may be well to enumerate the differences which exist between this case and Bertha's, since while resembling it in some particulars, it varies widely in others. Her affliction was constant; no periods of repose while awake; no cessation of movement during voluntary action; more quiet when she was at rest; no exaltation of patellar or other reflexes.

This group of cases have a common origin in a profound impression on the nervous system, occasioned by a great mental or physical shock. No such cause existed in the case under consideration. After the most careful inquiry, no history could be elicited which would class it among the *Shreck-neuroses*.

Two cases presenting some features in common with that of Bertha's were caused by cold.

Grasset[1] cites one as observed by *Jobert de Lamballe*, where there were rhythmical contractions of the peroneus brevis muscle. It was cured by tenotomy.

[1] "Maladies du Système Nerveux," t. ii, p. 439.

C. H. Parry [1] narrates a most interesting case of a widow fifty-one years old, who sat in a very cold room one day in February. At first she was seized with paralysis and rigidity of the left side. She had hyperæsthesia, hyperalgesia, flushing of the face, roaring noise in the occiput, a sense of tension and excitability. Six weeks after the commencement of her illness, vibrations of certain groups of flexors of the forearm and deltoid of the left side occurred, which varied in frequency, but were "tolerably regular, like the pulse," numbering eighty per minute; which increased in number when patient was heated or fatigued. The motion in the flexors could be controlled by forcibly extending the arm; though they were continuous in the deltoid. It is not surprising that pressure on the right carotid removed the attack, while there was no influence when pressure was made upon the left. The symptoms referable to the occiput, the sense of tension, disturbance of hearing, and flushing of the face would indicate a determination of the blood to the head. No such symptoms were present in Bertha's case, yet the same results were obtained.

An interesting case reported by Björnstrom [2] is that of a man who had a specific history. He had violent cephalalgia and nystagmus, with facial hemianæsthesia and, later, loss of consciousness. Three years after the latter attack he had flexion and extension of the left hand, which became rhythmical, varying from a complete abduction and extension to a flexion, slowly accompanied by adduction. The rate was one hundred and fifty per minute. When violently restrained he had violent movements of the head and arm. In profound sleep all ceased; but toward morning, while he was still asleep, the movements would gently re-commence to continue through the whole day. If the head was not sustained it would move in a horizontal direction. Such movements were more pronounced than voluntary ones.

No such adequate cause as has been found in these cases existed in Bertha's when the disease came upon her. It was not due to heredity; it was not brought about by any previous illness of any kind, or catching cold; there was no physical nor mental shock; no preceding loss of consciousness nor premonitory symptom beyond that alluded to in the arm. Anæmia might have given rise to it; but the child was not especially anæmic, though she has a sallow complexion, and the dark circles under the eyes, so often

[1] "Collection of Posthumous Writings," vol. 1, Lond., 1825.

[2] *Upsala lakareförenings förhandl.*, Bd. xii, 1877, p. 91; and *Rev. des scien. méd.*, 1879.

seen in connection with it. A microscopical examination of her blood showed the red corpuscles were 4,139,000 to the c. millimetre.

There was no reason to think the spasms were of reflex origin. She has passed the period of second dentition. There was no evidence of disturbance from worms, to which have been attributed unjustly, as some distinguished writers think, many disorders of the nervous system, some as grave as this. The mother has carefully watched her to ascertain if she were addicted to masturbation, without finding any thing of the kind.

Urine was normal.

The possibility of the trouble having some connection with the establishment of menstruation suggested itself more readily, since one of the cases which it most resembles seems to have some connection with that. There are no indications of the approach of puberty. Her sister did not menstruate until she was seventeen years of age. The case which has just been alluded to is one of the most important and interesting in the scant literature of the subject. It is reported by Prof. Ercole Galvagni, in his able article[1] "*Sugli Spasmi Ritimici Localizzati.*" This patient was a girl twenty years old, who had a constant oscillation of the right leg, contemporaneous with which there was a regular muscular tone, like the tic-tac of a watch. The spasms sometimes reached the high number of 174 per minute. They were controlled by first one remedy and then another, to return again after a longer or shorter time.

Section of the tendons of the muscles affected, peroneus longus and brevis, resulted in cessation of the spasm until the traumatism was healed, when it returned. Then a piece of the popliteal nerve was excised. Afterward the disease appeared in the upper extremities, one after another, and then in the left leg. There were disturbances in the sensibility, at first in two zones, one in the right superciliary region, the other in the affected leg. Later, there was insensibilty of the right side.

Charcot[2] reports a case in an article entitled "*De la Chorée Rhythmique Hysterique*" of a girl, otherwise apparently well, who performed rhythmical movements of the head, trunk, and extremities of the right side. There were alternate movements of extension and flexion day and night, twenty to forty to eighty per minute. She advanced, when she walked, with a rhythmical step as if dancing a mazurka. Pressure on the ovaries arrested the attacks.

[1] *Rivista clinica di Bologna* 1880.

[2] *Le progrès médical*, Feb., 1878.

The further history of Bertha's case is best developed in connection with an account of the treatment which was employed.

On October 26th Dr. Amidon made another thorough electrical examination with both the galvanic and faradic currents, after which a number of myographic tracings were taken in the manner already described. We obtained them from the origin and insertion of the muscles, as well as at the point where the contractions were at the maximum. Their character was the same, varying only in intensity, except that the supinator longus was inclined to show the slightly tetanoid contractions, which resulted in what might be called the "dicrotic" myogram seen in fig. 2. This was the muscle in which most of the effects were studied, since, with one exception, it was an epitome of the whole disease.

While making the electrical examination it was discovered that by passing either the constant or the interrupted current through the musculo-spiral nerve of *either arm*, the contractions could be stopped at will. This can be seen in the myogram, fig. 1, where the interval between the muscle curves was caused in this manner. The middle line was made by a chronograph needle, and shows when the current was introduced and taken off. The secondary current of a Kidder battery, with the cylinder withdrawn four centimetres, posts A. and D., was used. The same strength of current would stop the contractions in either arm, provided it was sent through the musculo-spiral nerve. A noteworthy fact in connection with the phenomenon was that the muscle always relaxed if the current entered it during a contraction. It was as if the muscle were caught in diastole. Sometimes it contracted again, though not so powerfully as without the current, and remained mildly tetanized; at other times it remained quiet. As has been said, we could stop the muscle at will and hold it for many seconds, but the muscle at length, as if impatient of control,

would recommence, at first feebly and afterward more powerfully, its rhythmical contractions. This is shown in fig. 7, below.

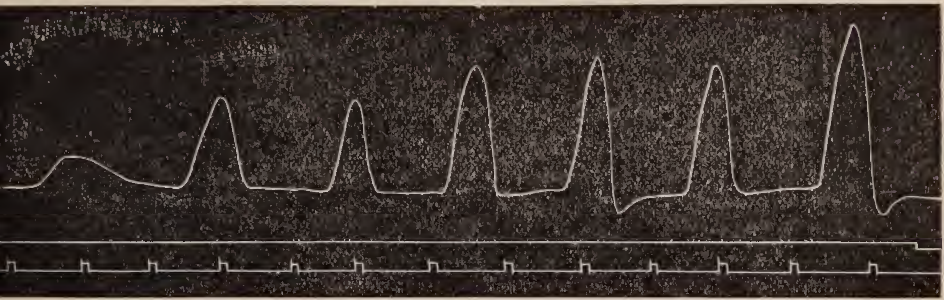

FIG. 7.

At this time there was no perceptible difference from emotion, or fatigue from running or walking; whatever she was doing the muscles kept up their incessant pulsating movements, and were apparently uninfluenced from within or without.

After this application of electricity, which was very long on account of the examination and the taking of the traces, the contractions which were then as many as 108 per minute, fell to 37, and then to 26. They were exceedingly irregular in intensity, sometimes very powerful and tetanoid in character (figs. 3 and 4).

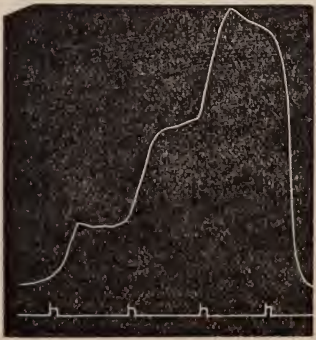

FIG. 3.

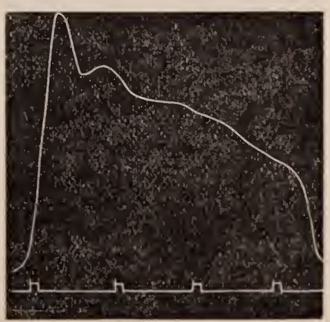

FIG. 4.

Their variations were perceptible to the eye. The nature of those seen in fig. 2 could not have been appreciated, except for the myograms. This instance affords an excellent illustration of the beauty and delicacy of the graphic method.

In four days after the electricity, the contractions in the left leg, which during this time had become more and more feeble, though of the same number as those in the opposite leg, ceased entirely.

While the movements were so slow, it was discovered that if the left arm, which had never been affected, were flexed and extended either rapidly or slowly, the muscles which were subject to the clonic spasms in the right arm and leg responded with the same number of movements, fast or slow as the case might be. In the same way making the passive movements with the right arm, the contractions in the right leg would be isochronous, and *vice versa*. Between these three members there was a pathological bond of union, though the left arm had never been affected. The left leg, which had so recently exhibited the spasms, was uninfluenced and unable to exert any influence.

Voluntary movements had no effect, as when either arm was used for any purpose, or, as might be supposed, when the leg was swinging regularly to and fro while the patient was walking. In this respect the case differs widely from the remarkable one reported by Weir Mitchell,[1] of what he has called " pendulum spasm."

Asleep the patient had no spasm, but when he was awake his left hand became rigidly closed, when it would execute motions like those of a violin player. The slightest movement of any other limb, in speaking or eating, or even if he were in bed, would cause a constant action, as if he were striking the bed. When he walked, the action became rapid, like a pendulum having a rhythm of 160 to 200 per minute.

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[1] *American Journal of Med. Sciences*, Oct., 1876.

This bond of union, in Bertha's case, between the muscles affected proved very convenient, for whatever brought down the number of the contractions in the supinator, produced a similar effect in the leg.

The slowing brought about by the electricity was not permanent. For a few days the clonic spasms were scarcely more than five per minute. On November 11th they were 96 per minute. After this electricity could only reduce them a little, and a month or six weeks later it increased rather than diminished them. This is one of the points of resemblance to Galvagni's case, where the contractions of the peroneus longus were increased from 80 to 174 per minute by galvanism, and faradism also, though at one time the spasm ceased after the use of the constant current. Unlike that case, however, the contractions were reduced when the supinator was drenched with hot or cold water, while in the other they were doubled in number.

After the electricity recourse was had to metallo-therapy. Charcot's girl, who had the hysterical rhythmical chorea, was susceptible to gold and tin. Bertha responded to gold and copper, but no effect was produced by the silver. Disks plated with gold were bound upon the belly of the supinator longus muscle. The contractions were notably reduced in fifteen minutes. After wearing them a longer time they fell from 60 to 15 per minute. They were also changed in type from the ordinary, as represented in the muscle-curves of fig. 1; they became irregular with a number of the tetanoid contractions shown in figs. 3 and 4, alternating with quick rapid ones, like those of fig. 1, only more exaggerated, since the muscular contractions were more vigorous. The effects of the gold were not lasting after the disks were removed. Once after keeping them on all night the contractions in the morning were very few, feeble, and irregular. Copper reduced them from 40 to 8 per minute. It also

altered the character. They were not tetanoid, but quick, and distributed in groups of twos and threes, with sometimes a single contraction. Usually there were eight such groups per minute. Zinc disks, which were tried later, reduced the contractions from 30 to 3 per minute. They were of the type seen in fig. 1, and not tetanoid.

The effect of the metals is most interesting, and would afford a most instructive and fascinating study when taken in connection with the experiments of Messrs. Charcot, Luys, and DuMontpallier,[1] which they performed as a committee of the *Société de Biologie* to investigate Dr. Burq's discoveries in this branch of therapeutics.

Metals failing to stop the contractions, only reducing them temporarily, magnets were next resorted to. Galvagni tried them early in his case; and after the fifth applica-

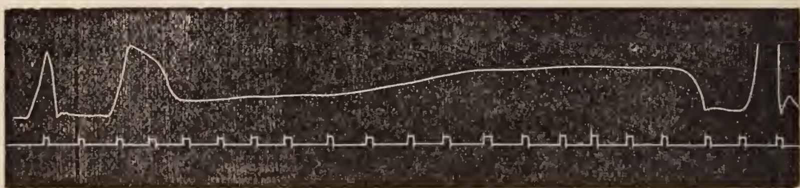

FIG. 5. (Reduced one half.)

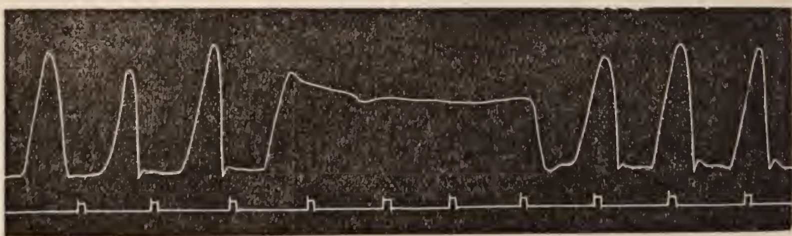

FIG. 6.

tion there was a complete cessation for three weeks. At the time of the trial of the magnets the contractions presented a curious phenomenon. They were of the type seen

[1] "Étude Expérimental sur le Metalloscope et la Metallotherapie du Dr. Burq."

in fig. 1, that is, not tetanoid. The number per minute was very nearly constant, forty-two to forty-five, which were distributed into eight or nine groups. While the number of contractions and the groups were nearly the same for succeeding minutes, the contractions in the groups were very variable, ranging from two or three to a dozen or more.

For these experiments, three large horse-shoe magnets were used. They were not placed in contact with the muscle (the supinator), but about twelve millimetres from it. After twenty-five minutes the contractions were reduced to seven or eight per minute. They were much weaker, and some were of the long tetanoid character seen in figs. 5 and 6.

Several other applications were made. Immediately after the removal of the magnets, the clonic spasms were not greatly lessened in number, but each minute they became fewer and changed in their nature. Often they were six in number: two tetanoid, two of the ordinary type, the arrangement of which was not constant, followed by two very slight contractions. Fig. 8 represents it diagrammatically.

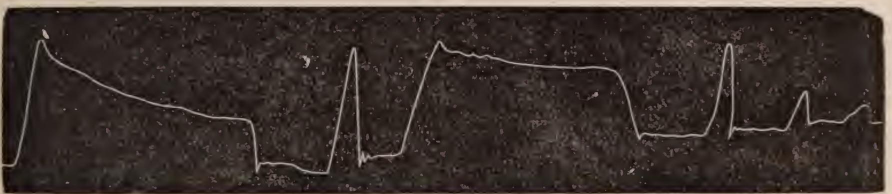

FIG. 8. (Diagrammatic.)

The results were not permanent, but the next day, or at most in two days, the clonic spasms would be nearly, if not quite, as fast as ever. The slowest attained by the magnets was one per minute.

It was suggested that the effect of the magnets was due to "expectant attention." So mock magnets were tried in such a manner that the child could not doubt that she was sitting by the true magnets. After twenty-five minutes, as after

the other magnets, the contractions were counted for ten consecutive minutes, during which time they were reduced from thirty a minute to the six which were thought to be so characteristic; the two tetanoids, followed or preceded or alternating with two of the ordinary type, followed by the two slight contractions which gave so peculiar and as was thought, characteristic effect of the magnets.

It seemed impossible, though the child is uncommonly bright for her years, that she was capable of receiving so profound a psychological impression. As a matter of course she would think all the means employed were for the one thing, the stopping of the movements which had annoyed her so long.

To solve the problem, the following experiment was tried. She assumed the position in which she had always been placed for the magnets and the mock magnets: her arm flexed at an angle upon the table, so that she might be easy and comfortable. A book was placed, instead of the magnets, so that it could be seen if she moved. The result was identical with the two other experiments. Here again were the two tetanoids, the two of the ordinary type followed by the two slight contractions. At one time, by simple position, they were reduced from 109 to 4 per minute. The effects lasted, like those of the magnets and the mock magnets, for hours, and by constant repetition of this exceedingly simple means, they were reduced to one in two minutes.

About the last of November it was noticed that the contractions were increased by exercise and emotion, though, as has been stated earlier, the most careful observation revealed no such effect.

Seeking to obtain some means of bringing about permanent results, I next tried nitrite of amyl. In Charcot's case it had been used successfully. The first time Bertha inhaled

it, the clonic spasms, which were from twenty-four to twenty-eight per minute, were immediately doubled, and as the pulse, which, at its maximum, was one hundred and twenty beats per minute, subsided, *pari passu* the movements subsided with it, till, when the evanescent effects of the drug on the circulation had passed away, they were of the same number as before. Here, then, might be a key to the mystery: the increased flow of blood caused by the nitrite of amyl had stimulated the motor centres of the cortex, just as the withdrawal of the blood by pressure on the carotids had depressed them. The next trial of the drug, however, pitilessly wiped away this theory. The contractions decreased *pari passu* with the acceleration of the pulse, so that the contractions, which were between twenty and thirty per minute when she first inhaled it, fell to four at the time the pulse was one hundred and twenty. The previous acceleration was probably due to the excitement incident upon experiencing the peculiar influence of the new and strange medicine. The effects of the nitrite of amyl were more permanent than any thing which had been tried. While using it the muscles were only contracting to one a minute when a tragic event occurred which, had it happened before the disease had commenced, would have at once classified the affection as a *Shreck-neurosis*.

Bertha's brother, a young man, was returning from his work late one Saturday night, when he was overtaken by three men who robbed him and shot him, the ball passing through the thorax. It was thought he could not live. The policeman who had sent him to a hospital aroused the family at three o'clock in the morning with the dreadful intelligence that the young man was dying. Bertha said the contractions, which had been very slow up to that time, immediately started up. When she next came to me they were going with the same pulse-like rhythm, contracting

at the rate of over one hundred per minute. Simple position reduced them in twenty-five minutes to four a minute, introducing the tetanoid type (fig. 6). The muscles were rigidly tetanized, and were held contracted ten, fifteen, and sometimes eighteen seconds. Bertha complained that these powerful spasms were painful and tired her. Ordinarily the contractions caused a sense of fatigue. About a fortnight after the accident to the brother, who, by the way, slowly recovered, the movements appeared again in the left leg, which had been quiet for six weeks. The vastus externus contracted rapidly, with varying intensity, at the rate of seventy per minute, and sometimes more. The sartorius was also involved, but was slower than the vastus externus. Contractions in the right leg and arm were only two or three per minute. Pressure on the carotid would stop them on the side opposite to the one on which it was exerted. The peculiar associated movements before described were lost entirely. Nitrite of amyl was used three times a day. At first the left leg was not much influenced, though the rhythm was destroyed, and long tetanoid contractions or pauses took place, the nature of which could only be determined by the graphic method. It is beautifully shown in fig. 5; the myogram was taken from the vastus externus. The tambour was placed eight centimetres above the knee. The downward stroke shows the partial relaxation of the muscle, which was then held contracted eight seconds. In some instances its return to a state of relaxation was so gradual as not to be perceived by the finger.

The next day when the child returned, to my great astonishment there had been an exchange of movements. The vastus externus was contracting slowly, five per minute, the sartorius of that leg had ceased, while the supinator and its allies of the right leg were working at the rate of eighty per minute rhythmically, except for one, two, or three

long tetanoids (fig. 5), which occurred at the same time and were of the same number as those in the left leg, only the latter were shorter, always ending before or beginning a little after.

After nitrite of amyl there was a marked diminution of the contractions on the right side, without much effect on the left. In a day or two, however, they became perfectly isochronous, after which they ceased entirely in the left leg.

Then the contractions on the right side were reduced gradually until there was one contraction in three quarters of an hour.

Scarcely a week elapsed before she appeared one morning with the discouraging announcement: "Doctor, it is going again as fast as ever." Sure enough it was. It had not reappeared in the left leg, but the supinator was pulsating with its old-time vigor, as if possessed by an indomitable sprite which, having been so nearly subjected, rejoiced to regain its sway. Nitrite of amyl had lost its power.

Then recourse was had to hypodermic injections of atropine. After the first (0.0005 gm.), the contractions were reduced to one in ten minutes; after the second, to one in twenty minutes; after the third, to one in three quarters of an hour. These were given at intervals of twelve hours. Several days after she received a fourth. Since then the contractions, though occurring a very few times in the day, in the supinator only, have practically ceased.

With Galvagni's case in mind, the prognosis looks not altogether favorable. That yielded to various treatment for days or weeks, to return again, while this, partially yielding, has shown till now, a non-subjugation truly discouraging.

The long list of remedies tried for the Italian has been mostly used for Bertha. Among those untried are curar;

tenotomy, which failed in that instance, for as soon as the traumatism healed, the clonic spasms reappeared and exsection of a portion of the popliteal nerve, which paralyzed the extremity, and after which the contractions appeared in other parts of the body.

Among the drugs tried without effect were ergot and bromide of potassium. During the time she has been under observation she has taken cod-liver oil and iron for constitutional treatment.

The problems which present themselves for solution in such a case as this are many, and the speculations to which they give rise are endless.

Why the associated movements in three members of the body, and their disappearance when the non-participating member is affected?

Why are the contractions of both leg and arm interrupted by the application of faradism to the musculo-spiral nerve of either arm?

Why the cessation of spasms on the pressure of the carrotids?

Why the efficacy of simple position?

Why the different effects produced by different metals?

Why the action of nitrite of amyl? Does it depress the nerve-centres, and if so, is its effect on those of the cord [1] or the cerebrum? [2]

Why are the effects of the treatment so transitory?

From the problems one passes to the speculations.

Is it reflex and spinal, like the saltatory spasms described by Frey, Bamberger, and Guttmann, and as probably is the case of Friedrich's "Paramyoklonus"?

Is it centric? If so, is it a cerebellar disturbance,[3] or an

[1] Wood, "Treatise on Therapeutics," p. 349.

[2] Nothnagel, "Handbuch der Arzneimittellehre," p. 402.

[3] Ross states the theory that "the cerebellum is supposed to preside over tonic, and the cerebrum over clonic, contractions."—"Diseases of the Nervous System," vol. i, p. 135.

exalted condition of the psycho-motor centres of the cerebrum, or a disturbance of the centrifugal fibres in the corpus striatum? Or is it functional?

Most of the cases which are in any way parallel to the one under consideration have been placed before the reader. Soltmann,[1] Erb,[2] Eulenburg,[3] Paget,[4] Duchenne,[5] and other writers on nervous diseases, draw the attention to the fact that the cases of clonic spasm of the extremities are rare. The writers enumerated mention instances. I have not been able to find the record of a case in which it occurred in a child.

The only conclusion in the present state of knowledge of the subject, to which all investigators doubtless would subscribe, is summed up in the saying of Morgagni: "Textura obscura, obscuriores functiones, morbi obscurissimi."

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[1] Soltmann: Gerhardt's "Handbuch der Kinderkrankheiten."

[2] Ziemssen's Cyclopædia.

[3] "Lehrbuch der Functionelle Nervenkrankheiten."

[4] Obs. de Mouvement Rhythmique Spasmodique. *Arch. gén. de méd.*, 1847.

[5] Sur l' Ectricité Localizeé.

DISSECTING METRITIS.

By HENRY J. GARRIGUES, M.D.,

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AT the meeting of the Pathological Society, held Sept. 13, 1882,[1] I presented a specimen of dissecting metritis, and mentioned that a similar loose body had been extracted from the womb of a patient under another physician's care, in this city. The disease would seem to be exceedingly rare, since no mention is made of it in any book, and since, among men with very large experience as curators, I have been unable to find one who has found such loose pieces undermined and cast off from the uterine wall. Even so special a work as Klob's "Morbid Anatomy of the Female Genitals" does not refer to the possibility of such an occurrence. All I have found in literature about it are two cases reported by the Russian physician Süromiatnikow.[2]

One would then incline to think that dissecting metritis is a very rare disease; and yet I have five new cases to report, all having occurred in less than five months, in the Maternity Hospital. Reserving number one for the previously reported case, I designate the next as

CASE 2.—Sarah W., æt. eighteen, American, primipara. Delivered October 12, 1882, with forceps, by an assistant, which operation resulted in a laceration of the perineum, extending through the

[1] *New York Medical Record*, vol. xxii, No. 15, p. 413. The same case is reported in detail in the December number of the *New York Medical Journal*, vol. xxxvi, p. 587.

[2] *Centralblatt für Gynäkologie*, 1881, vol. v, p. 276.

sphincter into the anus. The wound was closed with three silk sutures, but did not unite. On the thirteenth day the granulating surfaces were dusted with iodoform and three wire sutures introduced, resulting in a complete restoration of the perineal body.

On the third day after delivery, the temperature reached 102⅕° F., and varied until the end of the third week between 99° and 101°. On the fourth day, she complained of severe pains in the lower part of the abdomen. Three weeks after delivery, the fundus uteri was yet only two inches below the umbilicus. There were a little tenderness and swelling of the left broad ligament. But at no time the patient made the impression of being very sick. There was nothing remarkable about the lochial discharge, and the vagina was never examined with the speculum, nor did she have any intra-uterine injection, nor any local vaginal treatment beyond an injection of a two-per-cent. solution of carbolic acid three times a day. In the second week of November, she was somewhat nervous. On the 25th of that month, the forty-fourth day after delivery, I made a thorough bimanual examination from the vagina, and found the fundus uteri on a level with the brim, the whole organ freely movable, and nothing abnormal. Two hours later, while sitting upon a chair, the patient passed through the vagina an almost cylindrical, slightly pear-shaped body, six centimetres long, and 2.5 thick. Its surface was whitish, the interior of a bright red color, like a piece of fresh meat. It had no bad smell. Microscopical examination showed it to be composed of smooth muscular fibres, partially in a state of fatty degeneration, and interspersed with inflammatory elements. The body was not in the vagina when I examined it two hours before, but the manipulation of the womb had probably stimulated this organ to contraction, and caused the expulsion of the body concealed in its interior. In this case there was no diphtheritic inflammation of the vagina nor any fetid discharge. The slow involution, the pain, the soreness, and the moderate fever were the only signs of an abnormal process being present.

CASE 3.—Sarah L., æt. eighteen, German, primipara, was delivered Nov. 23, 1882, by an assistant. Forceps applied low down; perineum intact. The patient did well for a week, except that the uterus remained in a state of partial subinvolution. The temperature was below 100°. As it had risen to 101° in the evening of the 29th, I examined her the next day with the speculum, and found diphtheritic patches in the vagina and on the cervix. These were touched with a fifty-per-cent. solution of chloride of

zinc, and the uterus washed out with two-per-cent. carbolized water and injected with about one ounce of an eight-per-cent. solution of chloride of zinc.

The next day (Dec. 1st), the uterus was washed out with two-per-cent. carbolized water, which brought away a small amount of shreddy tissue.

On the next day (Dec. 2d), a new suspicious spot was observed on the cervix, which was touched with the strong solution, and the uterus was injected with the milder.

Two days later (Dec. 4th), a few new patches were touched in the vagina. No intra-uterine injection was given.

The next day (Dec. 5th), a new spot was found on the cervix, which was touched as before, and the cavity was treated as described above. After that the sloughs began to clear off, and no new places were attacked. The patient felt well; the appetite was good, and the temperature became normal.

On Dec. 11th, eighteen days after delivery, she passed from the vagina a flat, pear-shaped piece of tissue measuring six centimetres in length, 3.5 in width, and 1.3 in thickness. It smelled fearfully. It was full of small openings, some round-like pin-heads, others linear, two millimetres in length—uterine sinuses. The outer surface was of a light gray color, the interior of the tissue rosy, but not so fresh-looking as in the preceding case. On microscopical examination, it was found to be composed of smooth muscular fibres, partially in a state of fatty degeneration, and interspersed with inflammatory elements.

On the 13th, the sloughs produced by the cauterization, were entirely cleared off. After that she continued doing well, and was discharged when the granulating surfaces had healed.

Only one evening (Dec. 5th), the temperature reached $102\frac{1}{2}°$.

Case 4.[1]—Ellen C., æt. thirty-nine, multipara, was delivered Oct. 19, 1882, at about eight months of utero-gestation. The labor was normal up to the third stage. Credé's method of expression, which I always use, having failed to deliver the placenta in an hour and three quarters, the house-surgeon, Dr. Samuel Pierson, introduced his hand, and found the upper part of the placenta attached to the fundus, from where it was peeled off with great difficulty. The organ was found to be composed of two parts

[1] The expulsion occurred earlier than in Case 3, but the specimen was supposed to be placenta, and the microscopical examination was not made until the other cases had been observed.

joined by a membranous portion. Immediately after the removal of the placenta, the uterus was syringed out with warm two-per-cent. carbolized water. The next day the temperature rose to $102\frac{1}{2}^\circ$, and continued more or less elevated till Nov. 5th, the maximum ($103\frac{3}{4}^\circ$) being reached on Nov. 1st.

The uterus underwent normal involution, but there was some fetor to the lochia from the first. The uterus was syringed out two or three times daily, with warm two-per-cent. carbolic solution, but never were any shreds discharged. The case was diagnosticated as a low grade of septicæmia, and treated with quinine, carbolic acid internally, and stimulants.

On the seventeenth day after delivery (Nov. 5th), the patient passed from the vagina a large, flat body, measuring twenty by thirteen centimetres. The thickness varied very much. While some places were as thin as paper, others, even after the specimen had been for a long time preserved in undiluted alcohol, were a centimetre thick, and the house-surgeon described the fresh specimen as reaching, in some places, an inch in thickness.

Microscopical examination showed a much more advanced degree of fatty degeneration than in any of the other cases. Large spaces were exclusively composed of fine granules, which, by different focussing, appeared black or shining. On the other hand, there were by far not so many inflammatory elements.

The uterus was at once syringed out with carbolized water. The next morning the temperature was normal, and so continued. After staying some little time in the convalescent ward, the patient was discharged well.

Case 5.—Johanna B., æt. twenty-one, born in the United States, primipara, was delivered January 10, 1883, after a normal labor. The next day, the fundus of the uterus and both groins were found very tender. The involution was slow, the regions of the broad ligaments became indurated, the tongue was coated, and on the third day the temperature rose to 101° F. She was treated with ice-bladder, tincture of iodine, ergot, opium, quinine, and intra-uterine injection of two-per-cent. carbolic-acid solution. From the 22d to the 25th she was covered with an erythematous eruption. The lochia were free, but fetid and dark.

On the 26th all pain and tenderness had disappeared, and the fundus stood three inches under the umbilicus, but a few days later the tenderness returned, and every afternoon there was a rise in temperature to 101° or $101\frac{1}{2}^\circ$, accompanied by flushing of the face, and a burning sensation in the cheeks. The lochia were

copious, purulent, and fetid. Specular examination (Feb. 5th), revealed only a granulating os, which bled on the slightest touch. The intra-uterine injection was repeated a few times, and brought shreds and bloody clots out, besides pus.

On Feb. 10th a fleshy mass was found in the oakum with which the vulva was covered. It measured 7.5 by 2.5 and 2.0 centimetres. It had a very disagreeable odor. The surface was grayish, the interior flesh-colored. In the substance were seen large sinuses, some of which were empty. Microscopical examination showed that it was composed of smooth muscle fibres in a state of fatty degeneration, interspersed with numerous inflammatory elements.

After the expulsion of this body the uterus contracted quickly, the fetid discharge disappeared, and all signs of inflammation disappeared, and she left the hospital a few days later in excellent health.

Case 6.—Julia S., æt. twenty-two, born in the United States, secundipara, was delivered Jan. 3, 1883, after a normal labor. Three days later the fundus and left groin became quite tender, and the lochia slightly fetid. Soon both groins became firm and tender, the abdomen somewhat tympanitic, and the tongue coated. The temperature reached $102\frac{2}{5}°$. A similar treatment was instituted as in the preceding case.

An abscess formed in the left breast and was very slow to heal. She coughed, and stethoscopy showed the existence of chronic pneumonia in the apex of the right lung.

The lochia became very profuse and fetid. On Feb. 19th, forty-seven days after delivery, there came a sudden gush of lochia of dirty white color and intensely fetid odor. Upon examination, a mass was found protruding from the vulva, which could not be detached. By means of a speculum, it was found to adhere to the interior of the cervix, and was cut away with scissors. It was a black membranous body, measuring ten by 4.5 and 0.3 to 0.7 centimetres, having an offensive odor and showing numerous apertures exactly like the other specimens.

From this time the patient began to improve rapidly. The uterus retired behind the symphysis pubis, the appetite became good, the cough diminished, she felt well, gained flesh, and is at the hour of writing this in full convalescence.

My six cases, Dr. Noeggerath's case (the same as Dr. Kucher's), and the two described by Süromiatnikow,

were all puerperal. The latter took the condition for typhoid fever on account of the high temperature, but this may as well have been due to septicæmia. In two of my cases was found the characteristic diptheritic infiltration of the vagina and cervix, not only occurring in wounds, but likewise appearing in places where not the slightest abrasion was visible, and all these cases occurred at a time when we had many other diphtheritic cases, one of which died. In this last case the diphtheritic nature of the disease was not surmised, because nothing was to be seen in the vagina, and the mucous membrane of the cervix was so little affected, that, with the limited experience we then possessed with this dangerous disease, we did not recognize the character of the affection. But as this case throws much light upon the way in which these large bodies are detached I shall mention what the autopsy revealed.

Autopsy on Hanna D. thirty-eight years old, born in Ireland, delivered Nov. 1st 1882, died Nov. 8th.—The fundus reached up to a distance of two inches from the umbilicus, although the patient had lived a week after confinement. The lower edge of the omentum was adherent to the fundus on a small spot, which had a yellowish-green color. No other peritonitis was present. The uterus was enormously increased in bulk. It was nine inches long, five inches between the tubes, and one inch thick, except on the placental site, which was found on the anterior wall, and where it measured two inches.

From the external os uteri to a short distance above the internal os, the prominences of the mucous membrane were covered with a yellowish diphtheritic exudation, which was not easily removed by scraping. Surrounding either uterine opening of the Fallopian tubes was found embedded in the tissue a similar patch of diphtheritic exudation about the size of a three-cent piece. From these points the diphtheritic exudation extended out toward the subperitoneal part of the wall, apparently following the uterine vessels.

The wall was very flabby, and the red color was variegated by yellow-greenish spots. At a few places a thin yellowish material

could be squeezed out from canals, which seemed to be the lymphatic vessels. The broad ligaments, ovaries, and tubes were about normal.

Here, then, we have a case of diphtheritic metritis. When we bear in mind the large size of the womb, the enormous thickness of the walls, and the way in which the diphtheritic infiltration, from a small spot on the inner surface, spread far away near the outer surface, we can understand how these large, thick bodies can be cast off.

All the cases showed more or less marked symptoms of metritis, such as swelling and tenderness of the womb, purulent and often fetid discharge, and moderate fever. The time when the expulsion occurred varied from the seventeenth to the forty-seventh day after delivery.

This disease is entirely different from what is called gangrene or putrescence of the uterus. In the latter affection, parts of the interior surface are reduced to a black, jagged, fetid slough. In our disease, large pieces of comparatively normal, merely inflamed, tissue are thrown off. Sometimes there is no fetor whatever to the lochia, or to the piece itself, and the patient does not even appear to be seriously ill (Case 2).

The microscopical examination shows almost the same in all the specimens. The bulk is made up of smooth, muscle fibres, in a more or less advanced stage of fatty degeneration. The amount of connective tissue between the bundles and cells is more or less considerably increased, and it contains more or less numerous small round cells. We find, furthermore, thrombi in the process of organization, being composed of a net-work of fibrin with interspersed round cells, and, finally, numerous veins and capillaries filled with blood.

If anybody should ascribe the formation of such loose bodies to the action of the chloride of zinc, I would call at-

tention to the fact that this treatment was only used in the two cases in which the diptheritic process was visible in the vagina and on the cervix. With as little ground is the disease attributable to the use of ice-bags instead of poultices, which is the common treatment in this country, for the ice-treatment has superseded the poultices in Germany many years since, and there the disease has not been noticed.

If we are allowed to form an opinion from the small number of cases known, the immediate danger as to life is not very great. Of all the nine cases, my first patient was the only one who died, and her death was accidental. But, nevertheless, the condition is a very grave one. This patient would not have been killed by a rupture of the uterus, due to an intra-uterine injection, if her uterus had not been reduced to the thinness of paper, besides being actually perforated and communicating with the intestines. Several of the other patients showed evident symptoms of a slow septic absorption. Finally, there is a great danger lurking in the future for these women. The muscular tissue is not replaced. The only case that ended fatally showed that the diphtheritic process had been checked, and all ulcers were healed with an enormous loss of substance. Consequently, these women, in a succeeding pregnancy, will be very liable to sustain a rupture of the uterus.

Dissecting metritis will, as a rule, not be diagnosticated before the process which detaches a part of the uterine wall from the rest of the organ has run its course. No particular treatment is therefore required. If the presence of the loose body be diagnosticated, it would seem wise to try to draw it out with a pair of forceps, and even to dilate the cervix, if necessary, for the accomplishment of this purpose. The diphtheritic inflammation I treat, as above described, with chloride of zinc. Tincture of iodine, iodoform, and

concentrated carbolic acid have proved insufficient in my hands, while the chloride of zinc has given excellent results. The application is so painful that it is not only humane, but safer, in order to avoid shock, to make it under the influence of an anæsthetic. The general treatment consists in carbolic acid, quinine, and stimulants. The profuse purulent or dirty and offensive discharge calls for disinfecting intra-uterine injections. Where diphtheritic infiltration is visible, I use chloride of zinc, eight per cent., repeated according to circumstances, *i.e.*, the extension of the diphtheritic process or a bad character of the discharge from the womb. In the other cases I use carbolized water, two per cent., repeated two or three times a day. In case 6, the general condition of the patient being very unsatisfactory, I used instead of carbolic acid a concentrated solution of boracic acid (four per cent.) once a day.

The slough produced by the cauterization with chloride of zinc, comes off in about a week, and cicatrization follows in another week or two, according to the size of the denuded surfaces.

Of the specimens referred to above the first four have been demonstrated and microscopically examined in the Pathological Society.

VERATRUM VIRIDE IN TYPHOID FEVER.

ITS LOWERING OF THE PULSE AND TEMPERATURE—TWENTY-EIGHT SUCCESSIVE CASES IN PRIVATE PRACTICE, ALL RECOVERING. 1873–1882.

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THE treatment of every disease at first is tentative and theoretic,—fortunate if at last it becomes in a rational sense specific or uniform. It varies in its methods, even with a common theory, to say nothing of many theories. For a decade, accepting the excess of heat as the measure of chemical and destructive changes, and as the chief cause of death in a disease so prolonged as typhoid fever, how many remedies have been tested!—digitalis, quinine or calomel in heroic doses; veratria, described by Ziemssen, given to induce vomiting and sudden lowering almost to collapse, in the hope that the high fever may not return; and the cold-bath cure. Before the use of the thermometer, there were the anti-bilious treatment, the turpentine for the enteric symptoms, the empirical acid course; and, after all others, the expectant method.

We note the unsatisfactory character of these treatments by their indifferent interchange, by the liberty of experiment within certain limits, and by the result—a constant percentage of fatality.

It has long since come to this: We must take *care* of our cases, guard against injurious medicines, diets, excesses, and

oversights, and await an unknown termination. The disease, self-limited—if its subjects live long enough !—must exhaust itself any way, unimpeded by human effort.

But a cure for this fever should be found, in the same sense specific as quinine in intermittents, salicin in rheumatism, mercury in syphilis, arsenic for the skin, the bromides in epilepsy, or digitalis in diseases of the heart.

Our art should not be thought entirely out of its infancy when a disorder so fatal, without antidote, ravages the whole world. And the prolonged course of the disease should be a reason and a means of cure, not a cause of despair and inaction.

There was an axiom accepted, but quite disgraceful,—the cure of rheumatism is six weeks. No longer excusing ourselves in such failure, in the better sense now we say, we cure rheumatism.

Veratrum viride, green hellebore, was first brought to the notice of physicians by Professor Wm. Tully, of Yale College, in his lectures to his classes about 1830, as a substitute for colchicum in rheumatism and gout. He claimed it would cure a majority of the cases of these diseases, being "separated medicinally" from veratrum album and much less cathartic, also less so than colchicum. Dr. Chas. Osgood, of Providence, who first published a full account of the drug, *Amer. Jour. of Med. Sciences*, vol. xvi, p. 296, old series (1835), had his first knowledge from Prof. Tully. He advises its use in pneumonia, rheumatism, and gout.

Norwood, *Am. Jour. of Med. Sciences*, vol. xxv, page 281, 1853, is the first to allude to typhoid fever. He says: "We have treated several cases of typhoid fever in council (with verat. v.), where all the usual remedies had failed." * * * "Medicine of every kind whatever was withdrawn, and she (the patient) was put on the use of the tinct. of v. v., com-

mencing with three drops, to be increased every three hours." The case improved soon and recovered, though from the text it seems to have been desperate. Norwood continues: "If this were a single or isolated case, we would not have mentioned it, but we have treated a number of cases with a a like effect and success." In this case, he had vomiting, and in the others also. He objects to the giving of quinine and stimulants with the medicine.

Ringer says, fourth edition, 1875: "Typhoid fever, it is said, may be beneficially treated by veratrum," and "in the treatment of the foregoing diseases"—scarlet fever, measles, typhoid fever, etc.—"it is better to give small doses, as one or two minims every hour, rather than larger ones at longer intervals,"—the true way.

Barker, of New York, advises veratrum viride in quite large doses in puerperal fever. Agnew, of Philadelphia, in drop or two-drop doses in surgical fever; and Simpson, of Edinburgh, 1872, in the former disease, with some discourse on the helleborism of Hippocrates and the ancients, with which cure he classes this. Their hellebore was a cure for chronic diseases mostly, as insanity, epilepsy, neuralgia, dropsies,—a "separate" drug, yet near kin, botanically, to the v. v.

The Woods, of Philadelphia, and Stillé, and Bartholow, latest, advise against it, the last two being very sure of injurious effects. Stillé is contemptuous as to its use in typhoid. Dunglison and J. K. Mitchell, scarcely mention it.

Flint, Aitken, Reynolds, Bennett, Graves, Chambers and Niemeyer, do not class it with remedies for fever.

Up to 1873, I had only used veratrum viride in three thoracic aneurisms, one with a supposed cure and a relapse. I have never used it in pneumonia. In 1874, in the cases herein reported, this line of thought occurred to me.

High temperature, prolonged two or three weeks, kills.

Personal and recorded experience has only this lesson, spite of quinine, stimulants, effervescents, acids, cold baths. Now, if the pulse could safely, in this fever, be reduced from 110, or from 120, which, continued two or three weeks in adults, is usually fatal, to 90, and safely kept at 90 or 85—not at 70 or 60,—the friction of the heart and of the whole circulation one might expect would be lessened, in so considerable degree that the heat would naturally fall somewhat, at least. Just as in the dangerous friction of continuously running a steamship greatly beyond her normal rate of speed, every two or three additional miles per hour increases consumption of fuel geometrically, or by the square—not by simple addition,—and the friction of machinery and breakage are in the same proportion. Nor is the comparison untruthful. Consumption of material fuel, in each case, that of the living body and of the ship in motion by steam, are identical—the use of oxygen also. Breakage or exhaustion may be final in either.

Prevention of high heat is, however, very different from the abstraction of heat, by the cold bath.

Possibly this veratrum, considered depressing, as usually given, in a prolonged disease, otherwise given, as already intimated, only lowering the pulse to eighty-five or ninety, might benefit; and, by keeping down the heat a degree or two continuously, mitigate some or all symptoms and save life.

Besides the poison or ferment of the fever, we contend against its prolonged effects after incubation—rapid circulation, high heat, and inflammatory processes. The poison without these might not interfere dangerously with the physiological functions. Even if we could not antidote the ferment or poison, we might antagonize the effects and delay death till *vis naturæ* could restore the normal economy or eliminate the faulty product. The excessive friction of the fever at least we might try to obviate. The attempt is to mollify, not to abort or strangle, the disease.

The records thus anticipated are somewhat brief, but the pulse and temperature and worst symptoms besides, are fully given.

What was found? The skin was frequently moist, in some cases constantly, so that a somewhat natural bath followed, with its tendency to coolness; the tongue moist, a possible result of the respiration being more nasal, without the sordes often so irksome and significant.

Sleep has usually been quite natural, to be expected with the improvement of the skin and tongue. No faintness, no increased weakness as was anticipated; the patient permitted to have his head on the usual pillows, not especially low, as Stillé says; no vomiting, except in two or three instances, not necessarily to be attributed to the drug; no dangerous symptoms whatever seem to follow these small and frequent doses. Instead, a mitigation of the fever, of the cerebral symptoms, and of the abdominal, the stomach retaining nourishment well. The pulse is slowed, the temperature lowered one or two degrees very often in the second week. Rose-spots have infrequently been observed or have been doubtful. What is of more consequence, the complication of hemorrhage of the bowels, or of perforation, has not occurred.

The opinion obtains with me that the ulceration of Peyer's glands is aggravated greatly by the rapid circulation and high heat as usually prolonged, and that this desirable result of lessened friction and lessened heat, together with the slight tympanitis, the prevented diarrhœa, and the improved tongue during the second week, gives us another type of fever, one non-typical.

The usual diarrhœa, under other treatments, must be thought a result of the prolonged high heat, a means of elimination of waste and of the poison generated—conservative in some degree, at least. So is the colliquative diar-

rhœa of phthisis. In that we have also sweating. In both cases there is great heat. Reduce the heat in either to nearer normal, and the diarrhœa is no longer troublesome. Again, ulceration in both instances brings on diarrhœa, and high heat increases ulceration.

In typhoid with slow pulse the high temperature is also reduced and the general symptoms improved by the veratrum, in these moderate doses, without reference to the pulse.

Convalescence has uniformly been rapid.

New London has a general incline eastward toward the Thames, a river having deep currents and ocean tides. The city is most abundantly flushed with pure water from a beautiful lake, a reservoir formed by nature, seven miles distant among hills. Till within three years, there have been no proper sewers, and since, in only a few streets. Vaults and cesspools are stone-walled, not cemented ; and the soil or subsoil, too commonly infiltrated, in many places rests upon granite ledge. Cellars, of course, are sometimes polluted. The great quantity of water increases the danger, and often the vaults overflow.

The city-limits, the smallest in the State, if not in the nation, with four fifths of the population in the northern fourth, 9,000 in one square mile, crowd the dwellings too close to these imperfect receptacles. It should be anticipated that here is a very nest of typhoid, diphtheria, and its congeners.

For the past three years only, the ventilation of vaults and the trapping of sinks have been required by law ; and sulphate of iron has been freely used. Otherwise there has been little of sanitary precaution.

For the ten years during which my observations were made, there has been no epidemic of typhoid, but a severe one of scarlet fever in 1879, and of diphtheria, eighty-seven

deaths in 1880, and many cases of the latter for several years previous, and high death-rates. Yearly, there have been reported two to five deaths from typhoid, thirty-four in all. Some recoveries by other treatments have been very tedious. The entire population is 11,000.

Brief reports convey impressions of a mild type, of continued, of "two weeks" or "bilious" (?), fever. But the common cause, as far as we know, the termination, even in the mild type, too often disastrous, prevalence in the autumn or near to the autumn, bring many varieties under one species. These are all typhoid, with all its occasional dangers and complications. And in my patients, the bodily weakness, absence of appetite, the deafness, coma-vigil, and facies were characteristic, as also the pulse and temperature. Warnings from medical men and expressions of doubt most frequently accompanied statements of cases during their progress to recovery. Surgeon M. C. Drennan, U. S. Navy, in 1880, saw several patients, however, with approval and great interest.

All treated from the first, with any degree of thoroughness according to the method, are given. The preparation used is the officinal tincture, and the doses are from one to two drops per hour, with little other medicine, if any, from the setting in of the disease to convalescence. Age and sex must be considered, but children require a dose proportionally large.

The elimination of veratrum viride is rather rapid, so that these patients were usually under the influence of from three to twelve drops continuously. It occurred sometimes that the medicine was given only every two hours at night. The entire quantity in twenty-four hours would be from twenty to forty-eight drops; and this would go on day after day for ten, twelve, or fourteen days. By no means is the dose unappreciable.

The experience recorded here is sufficient to guard from disaster any physician following these methods. He should, of course, watch carefully the pulse and temperature. In medicines we do not chiefly regard names, and the results of careless or excessive doses. This powerful drug, reasonably exhibited for our special purpose, is not then depressing or dangerous. It is admitted that arsenic and mercurials are sometimes tonic and restorative. Yet mere names alarm our patients, and we yield to their timid scruples to our common disadvantage. The ordinary classifications of drugs are often, in this way, a great damage in our practice —bugbears.

Three questions are pertinent. Does the veratrum in these doses reduce the temperature one or two degrees, morning and evening, during the second week?

Is convalescence at the twelfth or fourteenth day a frequent result of the treatment?

Does the cure render the fever non-typical and less malignant in a great degree?

My own conclusion may be thus stated.—A tendency of the typhoid ferment to exhaust itself at about fourteen days the veratrum viride emphasizes, so that very many cases determine at twelve days, some at fourteen or fifteen, a smaller number at three weeks. Very few determine indefinitely, as do a large proportion in other treatments.

The pulse and temperature and memoranda, all recorded at the time of visit, may be taken as accurate, the thermometers being proved. The application of this instrument was almost always in the axilla.

REGIMEN.

Stimulants.—Essentially none. A little brandy or whiskey in cases 8, 17, and 25 only.

Diet.—Milk porridge, oatmeal porridge strained, milk,

beef tea, weak tea or coffee; orange juice in slight quantity; sometimes a little lemon juice.

Rest, etc.—Horizontal posture, upon back or side, both being advised at intervals. No visitors except the family and those needed. An airy room; a window frequently opened; temperature 65°. Occasional baths of vinegar and water, etc. Mouth, tongue, and teeth to be kept as clean as possible. The excreta disinfected.

1873.

CASE 1.—Miss C., age twenty. Fever. Oct. 29th to Nov. 13th inclusive, visited till thought convalescent. 22d, "relapse or phthisis acuta (?) R.: Tr. cinchon. co. et gentian. co., $\bar{a}\bar{a}$ (?) mix; ℥ i three times a day." 27th, "pulse 130; v. v., gtt. ss hourly." 30th to Dec. 6th, "pulse 125 to 130. Sibilant and moist râles. No cough." Daily visits. "R.: Tr. v. v., gtt. ii every two hours. Pulse reduced to 100. Comfortable. Milk diet." Much emaciation. Dec. 8th to 19th, v. v. and diet continued. "Improving. Pulse 100. Râles disappearing."

An unexpected recovery was complete, and was ascribed doubtingly to the v. v. 1882, still in good health.

CASE 2.—McC., girl, eight years of age. Coma-vigil, etc. Oct. 4th, pil. hydrarg., gr. iiss. Cold sponging till 6th.

1874.															
October . .		4	5	6	7	8	9	10	11	12	13	14	15	16	21
Day . . .		1	2	3	4	5	6	7	8	9	10	11	12	13	18
Pulse	M.		100		100	100	80	60	60	55	60				80
	E.	100	100		100	100	65	60	80	60	80				80
Temp.	M.		103°	103°	103°	103°	101°.8	100°.8	99°.5	99°.5	98°				98
	E.	104	105°	105°	105°	104°.5	102°.8	101°.3	102°.6	102°.5	102°.2	102°.2	101°.8	102°	98°.5
Dejecta . .			4				1								
Tr. v. v., gtt. .					12	18	10	8	8	8	8				
Tr. acon. r. gtt .					6	9	5	4	4	4	4				

Case. 3.—Oct. 8th, Daniel P., colored, age nineteen years. To Oct. 15th, inclusive, fever. V. v., gtt. iss., hourly. Convalescent in seven days.

CASE 4.—Robert B., barber, age twenty years. Oct. 23d, not well for four days. No appetite. Headache. P.M.: pulse 100, 70, 60, 70. T. 103°.3, 102°.2, 103°.8, 103°.5, 102°.5; till Nov. 1, 101°.6. V. v., gtt. 15 and 20, daily, 23d to 28th. Mild case. Nov. 2d, convalescent.

CASE 5.—Nov. 1875. College student, age twenty. Fever. Pulse rapid. Temperature 102° and 103°. V. v. only. No complication.

CASE 6.—Vallie L., age seven. Bad privy-vault. Aug. 9, 1876. Fever. R. hydrarg. subchlorid. gr. iss and pulv. rhei. 10th, repeat calomel. 11th, ol. ricini, ℥ ss.

		9	10	11	12	13	14	15	16	17	18	19	20	21
August		9	10	11	12	13	14	15	16	17	18	19	20	21
Day				1	2	3	4	5	6	7	8	9	10	11
Pulse	M.	100	90	100	110	120	115	100	100	90	100	95	90	90
	E.	90	95	110	110		90		100	90	95	100		95
Temp.	M.		99°	101°	102°	102°	102°.3	102°.5	102°	101°.2	101°.5	100°	99°	98°
	E.	101°	101°	104°	104°	104°	103°	104°	103°.5	103°	103°	103°	101°.2	98°.3
Dejecta		1			2						2			
V. v., gtt. . . .					18	24	24	24	24	24	24	24	24	

Convalescence undelayed.

1877.

CASE 7.—John W., age twenty. Ice fouled by sewage used in drinking-water. V. v. only. Convalescent in ten or twelve days.

1878.

CASE 8.—Mrs. B., widow, age forty-three. For some months in poor health from grief, etc.

Aug. 15th. Fever. R.: hydrarg. subchlorid., gr. i, and magnesiæ calcinatæ. Record tabulated till twenty-third day. Mind usually clear. Much weakness, however, during entire sickness, and apprehension. Though temperature did not rise above 100° or 100°.3 after twenty-third, convalescence was delayed four weeks. The pulse was usually weak. Quinine was given moderately, late in the case. The veratrum was given, perhaps too timidly. Aug. 31st, a day or two, ol. terebinth., gtt. xx., daily.

August . .		15	16	17	18	19	20	21	22	23	24	25	26
Day . .			1	2	3	4	5	6	7	8	9	10	11
Pulse	M.	100			100	100	95	100	90	85	85	90	90
	E.		100	100		100	100	100		85	90	95	90
Temp.	M.	101°.7			103°	103°	102°	102°.6	101°.8	102°.5	101°.5	102°.8	101°.8
	E.		103°.6	103°		103°	102°.6	102°.8		102°.4	102°	102°.8	102°.4
Dejecta . .		2				2	3	3	1	1	2	2	3
V. v. . .					15	12	12	12	12	12	12	8	18
Brandy .						℥ i	℥ i	℥ i	℥ i	℥ i	℥ i		

CASE 8.—Continued.

August . .		27	28	29	30	31	Sept. 1	2	3	4	5	6	7
Day . .		12	13	14	15	16	17	18	19	20	21	22	23
Pulse	M.	90	85	90	90	100	95	95	95	95	90	90	
	E.	90	95	105	100	100							90
Temp.	M.	101°.4	100°.5	101°.2	100°.6	100°.6	100°.1	100°	99°.4	100°	100°.2	100°	
	E.	102°.4	102°	102°.2	102°.2	102°.2		101°.4	101°.6	101°.4	101°.2	102°.2	100°.4
Dejecta . .		2	2	2	2	4				1*			
V. v. . .		18	18	18	18	18	18	18	18				

* Dejection normal.

1879.

CASE 9.—Bad vault, bad cesspool, bad sink. Mrs. F., age forty-five; fat.

Sept. 12th, R. : hydrarg. subchlorid, gr. iv. Sept. 13th, ext. pilocarpi., fl. ʒ i., and tinct. aconiti rad., gtt. i, hourly. Perspired freely and vomited. Coma-vigil, etc., marked.

September	12	13	14	15	16	17	18	19
Day	1	2	3	4	5	6	7	8
Pulse M.		100	105	110	90	100	100	90
Pulse E.	100		110	95	100	90	100	
Temp. M.		103°	103°	103°	102°.5	103°	102°.8	102°
Temp. E.	103°		104°	103°.5	103°.5	104°	103°	
Dejecta					2	1		3
V. v.				24	36	42	48	36

CASE 9.—Continued.

September	20	21	22	23	24	25	26
Day	9	10	11	12	13	14	15
Pulse M.	100	95	100		100	100	
Pulse noon							95
Pulse E.				110			
Temp. M.	102°	101°.5	102°			100°.2	
Temp. noon							98°
Temp. E.				102°.4	101°.4		
Dejecta	3	3	1	3	1	1	2
V. v.	42	42	42	48	40	36	15

Convalescence immediate.

CASE 10.—Edwin F., age forty-eight ; stout. Bad vault. Sept. 16th, rigors. Himself advised and took six Lee's pills.[1] 17th, pilocarpus and aconite to sweating. Coma-vigil and delirium during sickness, and very marked weakness.

September	17	18	19	20	21	22	23	24	25	26	27	29	Oct. 1	4
Day	1	2	3	4	5	6	7	8	9	10	11	13	15	18
Pulse M.		90		100	80				70					
Pulse noon			85			80		65						
Pulse E.	90	90		85			75			70	70	75	70	70
Temp. M.		102°		102°	101°.8				99°					
Temp. noon			101°.8			102°		100°.5						
Temp. E.	102°.5	103°		103°			102°			99°.8	100°.3	100°	100°.2	99°.8
Dejecta										2				
V. v.		36	48	36	36	36	36 ol.ric.	36	18	12	6	ol. ric.		

Oct. 4th, sitting up. Recovery immediate.

1880.

CASE 11.—John G. D., age four ; bright boy. June 5th, not well several days. In bed. Quick pulse, high fever. June 6th, ol. ricini, ℥ ss. Coma-vigil.

June	5	6	7	8	9	10	11	12	13	14
Day	1	2	3	4	5	6	7	8	9	10
Pulse—E.		120	115	115	115	115	115	110	100	90
Temp.—E.		103.°8	104°.5	104°.2	103°.5	102°.2	103°.2	103°.2	100°	98°.6
Dejecta			1 la	rge						
V. v.		6	18	18	18	18	18	18	18	12

CASE 12.—Joseph B., age twenty-three years. Basement house—hygiene and surroundings very bad. June 20th, tongue brown and dry. R.: hydrarg. subchlor., gr. iij. Constipation during sickness very marked, and ended with it. Recovery.

[1] Lee's pills = pil. cathartic. co.

June	20	21	22	23	24	25	26	27	28	29	30	July 1	2
Day	1	2	3	4	5	6	7	8	9	10	11	12	13
Pulse M.	110												
Pulse noon		115			90								
Pulse E.			100	95		90	90	80	75	75	75	75	
Temp. M.	102°												
Temp. noon		103°.2			101°.8								
Temp. E.			103°.2	103°.2		103°	103°	101°.8	101°.4	100°.2	99°.6	99°	
Dejecta							1						O.iv*
V. v.	18	32	36	36	36	36	36	24	24	24	12		
Ol. ricini				℥ ss.		℥ ss.			℥ ss.	℥ ss.	℥ ss.	℥ ss.	
Quinine							gr. vj.	gr. vj.	gr. vj.	gr. vj.	gr. vj.		
Calomel	gr. iij										gr. iij.	gr. iij.	

* Solid.

Case 13.—Thomas S., age twenty-four years, bartender. Exposed to contents of sink-drain during removal, etc. House hygiene bad. Boards with case 9. Afternoon temperatures, 103°, or thereabout. Pulse, 80 only. V. v., gtt. xxiv, daily. June 22d to 29th, a good deal of bronchial trouble. Convalescence sudden and uninterrupted; eighth or ninth day.

Case 14.—Lydia T., mulatto, age nine years. Surroundings very bad; disinfectants, etc., needed. June 30th, and July 1st, at school but ill; 2d, took pills; 3d, chilly, headache, diarrhœa—went to bed. During sickness, coma-vigil. At times, restless, legs drawn up, bowels tympanitic. Tongue dry and darkly coated for first week. Several nose-bleedings. July 5th, 6th, 7th, 8th: R.: hydrarg. subchloridi, gr. ii.; bismuthi subnitratis, ℈i; pulv. doveri, gr. viij. m. Chart. viij. A powder after each liquid movement, additional, to the v. v. This little black girl's case looked very badly. She recovered without an incident.

July	3	4	5	6	7	8	9	10	11	12	13	14
Day	1	2	3	4	5	6	7	8	9	10	11	12
Pulse M.			120	120	120	120	110	105	100	105	105	100
Pulse noon		130										
Pulse E.			120	125	120	120	110	105	110	105	105	105
Temp. M.			102°.4	102°.3	102°.5	103°	101°	100°.7	99°	100°.6	101°	99°.9
Temp. E.			103°	104°	102°	103°.2	102°	100°	101°.4	101°	100°.8	99°.6
Dejecta		4	6	4	4	5	4		1	1		
V. v.		15	24	20	22	30	18	18	12	12	12	12

Case 15.—Attended by Surgeon M. C. Drennan, U. S. Navy; myself in consultation. Harris L., age ten years, son of Dr. L., of Tenn. A brother sick of typhoid in Tenn., at the time, unknown to us. Harris was four weeks from home. Aug. 12th, not well for a week. Mother thinks he has been too much in salt water. Aug. 14th, pil. hydrarg., gr. v; 15th, quiniæ sulphatis, gr. vj. Coma-vigil, etc.

August	17	18	19	20	21	22	23	24	25	26	27	28	29
Day	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse M.	100	100	95	95	85	100	95	110	105	80	95	90	90
Pulse E.	110	95	90	105	105	100	95	110	105	95	100	105	95
Temp. M.	103°.5	103°	101°.5	102°	102°	101°.2	101°	102°.6	101°.6	100°	98°	99°.4	99°
Temp. E.	103°.3	102°.8	103°.6	102°.8	103°.6	103°.5	102°.8	103°	102°.9	102°.2	102°	102°.4	100°.6
Dejecta			1	1	2	3	2		1				
V. v.	12	20	24	24	24	28	32	36	40	24	8		
Quinine	3	3	3	3	4	4	4	4	4	4	4	4	4
Brandy or sherry											℥ iss	℥ iss	

CASE 16.—Virginia D., age fourteen years. House over a brook used to carry sewage. Sunlight shut off by high buildings, south and west. Delirious, etc. Very sick.

August	20	21	22	23	24	25	26	27	28	29	30	31
Day	3	4	5	6	7	8	9	10	11	12	13	14
Pulse M.	115	100	110	90	80	95	80	70	80	85	100	80
Pulse E.	120	100	100	110	90	95	80	95	90	100	90	85
Temp. M.	102°.5	102°.5	102°.2	101°.8	102°.5	102°.2	102°	101°.5	101°.2	100°.5	102°.7	98°.5
Temp. E.	103°.5	103°.5	102°.5	103°.6	103°.5	103°.4	102°.3	103°.2	101°	103°.4	101°.8	99°.5
Dejecta.	1	1	1			1			2		2	1
V. v.	30	36	42	34	30	42	36	36	36	24	36	
Calomel or morphia								M. $\frac{1}{8}$		M. $\frac{1}{8}$	C. 1	M. ^{11}

CASE 17.—Second case in house this season. Bad leak from privy-vault under window of sleeping-room. Foul odors.

Nellie M., age eighteen. Ordinary health delicate. Aug. 18th, not well for several days. Two Wright's pills. Seidlitz powder. 19th, chills, A.M. Ol. ricini, ℥ ss; tinct. aconiti rad., gtt. i, hourly. 20th, dysuria. Aconite continued, A.M. V. v., P.M. Coma-vigil, or delirium, with great restlessness. Twice escaped from bed. Weakness very marked. Diarrhœa. 7th, 8th, 9th, 10th, 11th, 12th, 13th days, R.: hydrargyri subchlorid., gr. i; bismuth. subnitratis, ʒ ss; pulv. ipecac., gr. i; pulv. opii, gr. ij. m. Chart. xij. A powder after each liquid movement. V. v. being continued. Headache. Nasal bleeding. Tympanitis.

August	20	21	22	23	24	25	26	27	28	29	30	31	Sep. 1
Day	2	3	4	5	6	7	8	9	10	11	12	13	14
Pulse M.	90	100	95	90	100	85	100	95	80	85	75	75	
Pulse N.													80
Pulse E.	100	90	90	100	90	80	90	95	95	80	80	85	
Temp. M.	101°.5	102°.5	101°.5	102°.8	102°.9	102°.8	102°.2	103°.2	101°.6	101°.3	101°	98°.5	
Temp. N.													98°.5
Temp. E.	102°.5	102°.5	102°.8	103°.6	102°.5	102°	102°.3	102°.6	102°.8	102°	101°.1	100°.5	
Dejecta	3	4	4	4	3	4	5	6	3	5	4	6	2
V. v., gtt.	12	32	42	36	42	30	24	36	24	24	30	15	
Quinine, gr.					6								
Chloral, gr.							15						
Brandy			℥ ss			℥ i	℥ ii			℥ ss	℥ ss		

After Sept. 12th, convalescence without incident.

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CASE 18.—Fred. C., age thirteen. Delicate boy. Overflow of cesspool. July 3d, chills. 4th, afternoon, pulse 110; temperature 104°. Mother thinks he has worms. Santonin and calomel in small doses. 5th, P.M., 104°. 6th, 7th, 8th, "fever."

July	9	10	11	12	13	14	15	16
Day	6	7	8	9	10	11	12	13
Temp. M.	102°.5		100°	99°	99°			
Temp. N.		102°.5						
Temp. E.	103°.5		102°	102°	102°	101°	100°	98°.5
V. v.	24	36	36	36	36	36	36	12

CASE 19.—Thomas E., coal-heaver, age forty-three. Bad sink,

pipe without trap goes to unventilated sewer, odor very bad, therefrom in the living-room. Aug. 6th, overworked and overheated. Aug. 11, in bed, headache, etc. Aconite, gtt. i hourly. Comavigil, etc.

August		11	12	13	14	15	16	17	18	19	20	21
Day		1	2	3	4	5	6	7	8	9	10	11
Pulse	M.	100				80		85				
	N.						95		85	80	75	70
	E.		90	90	90			85	80			
Temp.	M.	102°				103°		102°.7				
	N.						103°		102°	102°	100°.2	99°.3
	E.		103°		103°.6			102°.8	102°			
Dejecta								1			1	2
V. v.			12	24	24	24	32	40	36	36	30	18
Calomel, gr.		2						1		½		

Case 20.—Geo. H., age twenty-five, steam-engineer. Aug. 11th. feverish two days. Ext. pilocarpi. fl., ℨ i; tr. aconiti rad., gtt. i, hourly, and hydrargyri subchloridi, gr. ii, twice. Aug. 12th, P.M., pulse 100, temperature 104°. 13th, 14th, temperature 102°. 15th, P.M., 103°. After that, 101°. Pulse from 13th being 80; v.v., gtt. xx, daily. 23d, 25th, 27th, quinine, gr. vi. Malarial (?).

Case 21.—Mary E., age twenty-six, single, nurse-maid. Aug. 13th, been ill a week or so about the house. Sleepless at night. R.: lithii bromidi, gr. v, nocte. 16th, for diarrhœa, R.: hydrargyri subchloridi, gr. ij; bismuth. subnit., ℨ i; pulv. ipecacuanhæ, gr. i; morphiæ sulphatis, gr. i. m. Chart. xv. A powder after each movement. One powder, also, 17th and 18th. 22d and 23d, took tinct. opii, gtt. xx, and ol. terebinth., for diarrhœa. Comavigil, delirium, great weakness. Movements a few times without consciousness. Dejecta offensive.

August		13	14	15	16	17	18	19	20	21	22
Day		1	2	3	4	5	6	7	8	9	10
Pulse	M.						100	95	85	85	
	N.			100		95					65
	E.	100	100		100	110	105	80	90	65	85
Temp.	M.						103°	103°	102°	103°.2	
	N.			103°		103°.7					102°.5
	E.	103°	103°		104°.5	104°.8	103°.2	103°.7	103°	102°	103°.4
Dejecta					5	1	1		3	2	7
V. v.		8	20	20	24	30	36	40	42	36	20

Case 21.—Continued.

August		23	24	25	26	27	28	29	30	Sep. 1
Day		11	12	13	14	15	16	17	18	20
Pulse	M.	80	80	70	90			85		
	N.					75	70		75	
	E.	80	85	90	85					85
Temp.	M.	101°.5	100°.2	101°	100°.7			99°.4		
	N.					101°.4	100°.3		99°.2	
	E.	102°	102°.8	102°	101°.6					99°.7
Dejecta		1	1	1	1		1	1	1	2
V. v.		30	30	24	30	24	20	18		

Sept. 5th, went home to Bridgeport against advice. No harm, however.

Case 22.—Mrs. B., Swede, age twenty-eight. Acclimated. Eight years ago had ague. Her husband just recovering from a severe attack of typhoid. His pulse, though about the house, 115. Weakened heart. Quite as much trouble as she. He was treated with neutral mixture and quinine. Mrs. B. worn out taking care of him. Vault and cesspool and sink all bad. Coma-vigil, etc.

Oct. 11th, hydrargyri subchlorid., gr. iij ; ol. ricini, tinct. aconiti rad., gtt. i, hourly, etc.

October	11	12	13	14	15	16	17	18	19
Day	1	2	3	4	5	6	7	8	9
Pulse N.				95		90	90	85	
Pulse E.	90	85	85	90	90				95
Temp. N.				102°.3		102°.3	103°.5	102°	
Temp. E.	102.°5	101°.5	103°.3	103°.3	103°.3				103°
Dejecta				2			1		
V. v.		12	30	14	24	24	30	32	32
Calomel, gr.	1½	1½							

Case 22.—Continued.

October	20	21	22	23	24	26	28	30
Day	10	11	12	13	14	16	18	20
Pulse N.				85				80
Pulse E.	80	80			85	90	90	
Temp. N.				101°.2				98°.4
Temp. E.	102°.4	102°.3			102°	101°.5	101°.2	
Dejecta	1	1	1					1
V. v.	32	32	30	36	30	24	24	
Quinine						6	6	
Calomel, gr.						2	1	

Convalescence immediate.

Case 23.—John M., age thirty-four, teamster. Sleeping-room, eleven feet square, had an untrapped sink connected with an unventilated cesspool ; self, wife, and child occupied the room at night, without a window open. Oct. 17th, P.M., pulse 95, temperature 104°. With v. v., gtt. xxiv, daily, it remained, P.M., 102°, 101°, 100°, till it became 98°.6, Nov. 1st.

Case 24.—Isadore M., age seventeen, clerk, delicate. Vault close to house, uncemented, foul.

Oct. 28th.—Rigors for several days. R.: hydrargyri subchlorid., gr. ijss. A.M. Ext. pilocarpi. fl. ℨ i, P.M., with free sweating, vomiting, and movement. Night of 28th and 29th, sinapisms for pain in lower back. During sickness tympanitis and nose-bleeding, coma-vigil and wandering.

October	28	29	30	31	Nov 1	2	3	4	5	6	7
Day	1	2	3	4	5	6	7	8	9	10	11
Pulse. M.	90	80	90			80	80				
Pulse. N.				85	80			65	65	75	
Pulse. E.	90	95	90	85	85	85	80	85	75	70	70
Temp. M.		101°.6	103°.6			103°.4	101°.9				
Temp. N.				103°.7	103°.8			101°.8	101°	100°.2	
Temp. E.	104°	104°	104°	103°.2	103°	103°	102°.5	102°	101°	100°.6	99°.6
Dejecta		1			1	1	2	1			1
V. v.		24	36	24	36	36	36	36	24	20	18

Convalescence immediate.

Case 25.—Matthew V., age fourteen and a half; slender. "Not well for a week. Over-ate, five days ago." Nov. 23d, 8 P.M., chilly. R.: hydrargyri subchlorid. gr. iij. Tr. aconiti rad. gtt.j, half hourly till sweating. 24th, 9 A.M. perspired freely, and during night. Ol. ricini, ℥ ss. and tr. aconiti rad., P.M. R.: Hydrargyri subchlorid., gr. iss. Coma-vigil, etc. ; unconscious of calls of nature much of the time during sickness. Tympanitis, *sordes*. A bad case ; recovery hardly expected, emaciation extreme, bed-sores barely prevented.

November	23	24	25	26	27	28	29	30	Dec. 1	2	3	4
Day	1	2	3	4	5	6	7	8	9	10	11	12
Pulse M.		100	95	85	90	75	80	80	75	75	80	85
Pulse E.	110	110	90	80	90	80	80	90	70	80	85	70
Temp. M.		104°.4	104°	103°.6	103°.8	102°.8	102°	102°.7	102°.6	101°.9	101°.9	102°
Temp. E.	104°.5	104°	104°.8	103°.5	103°.6	104°	102°.7	102°.8	102°.1	103°	102°.5	101°.7
Dejecta		1	6	2		3	1	1	2	1	2	
V. v.		10	36	30	36	36	30	30	30	36	34	36
Calomel, gr.	3	1½	ol.ric. ℥ ss.									

Case 25.—Continued.

December	5	6	7	8	9	10	11	12	13	14	15	16	17
Day	13	14	15	16	17	18	19	20	21	22	23	24	
Pulse M.	85	85	90	95	90	90	100	95	95	95			
Pulse E.	85	85	90	90	90	100	105	100	110	100	85	70	
Temp. M.	101°.6	100°.7	101°	101°.7	100°.3	100°	101°	100°.7	100°.6	99°.4			
Temp. E.	101°.4	101°	101°.6	100°.7	99°.7	102°.1	101°.4	101°.2	101°.8	101°.1	100°.7	98°.1	98°.1
Dejecta			1		1			1	1	2		1	
V. v.	36	30	24	20	16	16	24	30	30				
Tr. digitalis, gtt			12	12	12	12							
Quinine, gr.				6	6	6	6						
Whiskey			℥ iss		℥ iss	℥ iss	℥ ij	℥ iij	℥ iij	℥ iij	℥ iij	℥ iij	℥ iij
Calomel			2	ol.ric. ℥ ss.									

Took his whiskey with milk. No delay of convalescence.

1882.

Case 26.—Mrs. G. widow, age forty-six ; fat. Sept. 14, feverish for two days. R.: hydrargyri subchlorid. ; gr. iij ; tinct. aconiti rad., gtt. i, hourly, etc., for twenty-four hours. Pulse from 100 reduced to 90. Skin moist, coma-vigil, wandering during sickness, very weak. V. v.. gtt. 30 to 36, daily, from Sept. 16th to 24th, Pulse 80; temperature morning *and* evening, 104°, 103°, 102°, 100°. and 12th, or 13th day, 99° and convalescent.

Case 27.—Miss L., age twenty-six, operative. Mill exposed to emanations of sewer-outlet, etc. Sept. 17th, rigors ; not well for five days ; four Brandreth pills, one dejection.

September		18	19	20	21	22	23	24	25	26	27	28
Day		1	2	3	4	5	6	7	8	9	10	11
Pulse	M.						90	95		90	90	80
	N.	100		96	90	90			90			
	E.			100	96				85	90	90	
Temp.	M.						102°.3	102°		101°.9	101°.6	100°.5
	N.	103°.5		102°.7	102°	102°.3			101°.9			
	E.			102°.5	102°				101°.5	101°.9	101°.4	
Dejecta							1				3	
V. v.		18	24	24	24	24	24	24	30	36	30 ol. ric. ℥ ss	20

Case 28.—Wm. McCl., age twenty-five, sailor. Sick five days at sea. Sept. 25th, P.M., pulse 100, temperature 102°. Brought ashore. 26th, etc., pulse 80 ; temperature 102°, 102°.5, etc.,

V. v. daily, 30 and 36 drops, till Oct. 2. Diarrhœa 26th, 27th, and 28th. R.: hydrargyri subchlorid., gr. ij ; bismuth. subnitratis, ʒ ss ; pul. ipecac. gr. iss.; morph. sulph., gr. i. m. Chart. xv. A powder three or four times daily, during diarrhœa. Oct 3d, convalescent.

ARTHROPATHIES IN GENERAL PARALYSIS OF THE INSANE.

By Dr. J. C. SHAW,

BROOKLYN, N. Y.

SOFTENING or fragility of the bones in the insane has been observed and made the subject of short communications in the medical journals for a number of years past. Gudden, Mercer, Biante, and Bonnet, Verneuil, Clouston, and Williams have reported cases as occurring in chronic insanity with malnutrition, senile dementia, and general paralysis; but few of the articles which have appeared have specially dealt with it as a lesion in general paralysis, and the cases mentioned have been fractures believed to have been caused by very slight injury, which in healthy persons would have caused no fracture.

There have come under my observation two or three cases of fracture of the femur in paretics, due to falls while running.

I have also not unfrequently observed the spongy tissue of the ribs and other bones softened and filled with a reddish semifluid material. These are, however, not the kind of cases I am about to speak of, but those in which spontaneous lesions of the bones have occurred without fracture or other injury. Three well-marked cases have been observed in which the lesions are evidently arthropathies. No cases of this kind have been reported, as far as I know. Voisin

mentions one case in which a hyperostosis of the femur was found post mortem, and another case in which an hypertrophy of the head of the tibia was found. These comprise the only cases which approached those I am about to report.

The histories are given in brief.

W. N., aged forty-four, Holland, married, admitted to King's County Insane Asylum Feb. 4, 1880.

Certificates in lunacy state that he entertains the most extravagant ideas of his own importance in the community, and imagines that he is the greatest business-man of the century. Says he is the owner of one hundred thousand acres of land on Long Island; that he intends to visit Holland and bring back with him large droves of all kinds of cattle to stock the farm with, etc.

Patient's wife states that for over three years past he has been troubled with shooting-pains in his limbs, back, and abdomen, which were thought to be rheumatic, and were relieved by wearing flannels, although they occurred at intervals. For the past two years has had trouble in retaining his urine, which would occasionally be passed involuntarily; has been nervous and irritable for the past year.

About the 1st of January, 1880, his delusions began. He thought he was carrying on a large produce business, made arrangements for shipping large quantities of grain to Europe, etc.; then he began to imagine that his bowels were constipated, and took large quantities of cathartic medicines (hypochondriacal ideas), which soon reduced him physically, and he lost flesh, but at the same time would remark to his friends how fat he was becoming.

On admission, has delirium of extravagance; says he is very wealthy, and engaged in a large importing and exporting business.

The duration of his disease is said to be three years.

He is in feeble bodily condition: sensation diminished; reflex action diminished; pupils regular; movements slightly ataxic; circulation good; vegetative functions performed normally; the desire to go to the water-closet frequently, still exists.

Feb. 18th. Delusions of extravagance still continue; partial dementia; is talkative and good-natured; complains of a feeling of fulness in frontal region.

April 14th. For the first time since admission has inconti-

nence of urine; tendon reflex entirely absent in both legs; there is slight ataxia in walking; it is very difficult to test the sensibility of lower extremities by reason of the patient's restlessness and partial dementia, but rough testing shows the sensibility to be diminished, no paresis of any of the extremities, but he is observed to walk a little lame on right leg, from what cause it is impossible to ascertain.

April 16th. Lameness in walking on right leg continues; he is put to bed, and examination of leg made with great difficulty, as he moves about, pushes the doctor away, and refuses to have it examined. Says it does not hurt him; it is believed that he has an impacted fracture of the neck of the femur; he, has however, had no injury or fall, and if it be a fracture, how it was brought about cannot be explained, and it is believed to be connected with trophic changes in the bones as we have previously observed them in paretics.

April 18th. Condition remains about the same. He gets out of bed, however, and walks about on the leg, evidently without any pain; he limps more than he did; there is a tipping of the pelvis backward and upward, his body inclined slightly forward; the gluteal muscles of that side have the appearance of being pressed outward, and are fuller and rounder than on other side; leg is a little shorter than the other when he walks. Consultation is held with a surgeon; patient will not allow examination, so ether is given, which he does not bear well. Has a kind of hysterical spasm and cyanosis during its inhalation, and artificial respiration has to be resorted to. No positive diagnosis made, but it is supposed by the surgeon to be a fracture of the ilium.

April 21st. An effort has been made to keep Buck's extension apparatus on the leg, but patient tears it off; repeated examinations of the leg by the surgeon show that patient suffers no pain whatever, and is evidently quite anæsthetic; to-day urine has to be drawn off morning and night.

April 22d. Urine drawn off to-day.

April 25th. Had no retention of urine since 22d inst.; gets out of bed, sits on a rocking-chair, and walks about the room.

May 24th. Patient has gradually presented the same external appearances of the left leg as he did of the right, and he evidently has the same trouble on left side as he has on right, and we believe it to be a fracture or dislocation of the femur on both sides, due to trophic disturbances in the bones; curious enough the patient still walks about with this serious disturbance of both hip-joints, without showing the slightest evidence of pain.

June 24th. Growing more and more demented; ceased to express extravagant ideas; condition of hips unchanged; for past week has had œdema of right leg, gradually increasing; to-day for first time œdema of left foot observed; he sits in an armchair most of the time, but is able to walk about his room in an awkward manner; evidently suffers no pain.

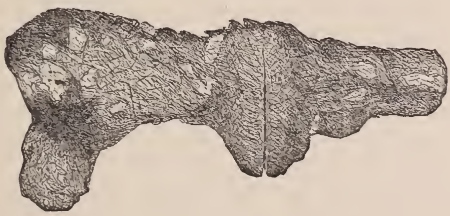
June 27th. Urine examined: cloudy, pale in color, sp. gr. 1008, clears up on heating, no albumen; to-day it is observed that the toe nails of right foot have undergone trophic changes. They have assumed a peculiar whitish, waxy appearance. He always denies having pain, and his general bodily condition appears good.

May 8, 1881. Marked œdema of both lower extremities, penis, and scrotum; urine dribbles away; it is again tested, no albumen found.

May 12th. Œdema of extremities quite extensive; urine dribbles away, it has to be drawn off; it is also found that a large number of glands in the femoral region have become enlarged, which probably causes some pressure on the veins, and may be in part an explanation of the œdema of the lower extremities.

Patient gradually sinks without any further special changes, and dies June 14, 1881. No post-mortem allowed, but persuasion induces his wife to consent to an examination of one of the hips.

The upper part of the right femur is removed, and its condition will be seen in the accompanying cut. Marked absorbtion of the



head of the bone has taken place; the entire upper part has become more spongy than natural; there is also a deposit of bone just below the trochanter, and is a separate development in the periosteum, and has no direct connection with the femur.

The condition during life was a dislocation caused by the absorption of the head of the bone allowing it to slip out of the acetabulum; the dislocation was backward and accounts for the position of the pelvis, body, etc., above noted.

This was evidently the condition on the other side also, and it

is to be regretted that we were not allowed to make a complete autopsy.

Case 2.—R. K., aged forty-five years, Ireland, married, admitted to Kings County Insane Asylum May 14, 1880.

Is intemperate. On admission is quiet and speaks sensibly; memory somewhat defective; speech slightly hesitating; pupils regular; tremor of tongue and facial muscles; also general tremor; no delirium of grandeur; is a case of well-marked progressive paresis.

Eight years ago had an injury to his head from falling off a wagon.

May 15th. Right pupil contracted; tendon reflex normal; complains of diffuse pain in head.

July 25th. Dementia increasing rapidly; speech becoming more and more indistinct.

August 15th. Trophic disturbances begin in fingers. Examination shows redness and swelling of the articulation between first and second phalanx of left middle finger, and examination shows luxation; manipulation causes no pain whatever; it is at first believed that he has had an injury, but inquiry shows that he has not.

August 17. Examination to-day shows left middle finger in same state to external appearance, and the same articulation of the ring finger, as in middle finger, is swollen and red. Examination of both these joints shows that there is crepitus when the articular surfaces are rubbed together, and there is evidently absorption of the articular cartilages; patient suffers no pain whatever on manipulation. It is evident that these are trophic changes. Patient has grown very much demented, has marked general tremor and difficulty in speaking.

Sept. 5th. To-day examination shows that there are redness and swelling of each of the small joints of every finger of both hands, the articular cartilages in every one of them are eroded, and there is crepitus when the bones are rubbed together; patient suffers no pain whatever on manipulation.

Dec. 14, 1880. Condition unchanged; grown more demented, if that were possible; quite feeble and unsteady in walking; retains his flesh and looks well. Condition of fingers unchanged; the trophic changes appear to have been at a standstill; no other joints have been affected.

May 12th. Patient's disease has been stationary until to-day, when he has a severe epileptiform convulsion and passes into a comatose state.

May 14, 1881. Coma continues; temperature reaches 107° F.; and to-day he died.

No autopsy was allowed.

Case 3.—F. D., aged twenty-nine, italian, baker, married, temperate. Admitted to the Kings County Insane Asylum April 12, 1882.

His wife is unable to give a previous history; it is stated that three months before admission he began to be irritable, at times violent toward his wife and family; had extravagant ideas; ordered blocks of houses, ships, wagons, and large quantities of goods.

On admission has hesitancy in speech; some degree of dementia; slight fibrillary tremor; no pupillary change; eats voraciously.

June 11th. Is emaciating; has become restless; disposed to strike the other patients; is destructive of clothing and bedding.

July 1st. Dementia extreme; has ceased to express delusions of extravagance; soils himself and bedding with urine and fæces.

Aug. 4th. Passing into a most deplorable condition; begins to have a number of small trophic sores on legs.

Aug. 26th. Has a slight hemiparetic attack. Still destructive.

Nov. 25th. It is to-day observed for the first time that he has a swelling of right lower maxilla which has heretofore been concealed by his full beard. Examination shows that he has extensive necrosis of middle of body of inferior maxilla; teeth have all fallen out; there are two small fistulous openings from the necrosed bone; there appears to be a dissolution of continuity of the bone, as crepitation can be felt; the fistulous openings discharge only a few drops of pus. Examination causes the patient no pain whatever; this is also evident, for he eats solid food without any apparent inconvenience, and not unfrequently eats on that side. He is evidently anæsthetic; testing the skin shows some loss of sensation; patient has received no injury and this is evidently a trophic disorder of the bones.

Dec. 28th. Patient has been observed to limp for the past few days. Examination shows redness and swelling of the right hip (the same side on which the diseased maxilla is); patient has received no injury; he is now kept in bed as much as possible. The condition of maxilla is about the same.

January 10, 1883. There is fluctuation over hip; opening is made and pus discharged; there appear also to be some trophic changes going on in this joint.

Feb. 28, 1883. Maxilla has ceased to discharge pus, and the fistulous openings have closed. There remains the same swelling and crepitation of the bone ; the opening over right hip has also closed, and patient's general condition has improved temporarily; he still limps on the leg, but there is no marked deformity. It will be observed that the diseased maxilla and hip-joint are both on the right side.

Case 4.—L. T., aged thirty-three (?), Denmark, sailor. Admitted to the Kings County Insane Asylum November 6, 1879.

On admision is a well-marked case of progressive paresis. He is a State pauper, and nothing is known of his antecedents or history, and he is too demented to give any information about himself. Speech thick, indistinct, and stammering ; unsteady in gait ; a certain amount of muscular rigidity ; pupils regular ; is in good physical condition ; has no delirium of extravagance ; tendon reflex slightly exaggerated.

Jan. 4, 1880. To-day has severe epileptiform convulsion. Conjugate deviation of head and eyes to the left.

March 11th. Difficulty in walking and dementia increasing.

July 11th. Epileptiform convulsion of right side, lasting about twenty minutes, the side becoming quite cyanotic.

August 12th. Patient stands in middle of hall calling out that he is dead, to remove him. At 11 A.M., has a slight epileptiform convulsion.

August 24th. Tremor, difficulty in speech and walk much increased, tendon reflex much exaggerated ; has a tendency to lean to the right side when walking (hemiparesis).

October 12th. Had convulsion this morning, confined to right side ; conjugate deviation of head and eyes to the right.

Temp. at 10 A.M., 98.4° F.; at 7.30 P.M., 100.3° F.

October 13th. Is up again, leans very much to right side and drags right foot. A succession of epileptiform and paretic attacks follow.

February 12, 1882. Has an epileptiform attack, passes into semi-coma.

February 13th. Has complete paralysis of left side. Temp. 102° F.

Patient remains in this semi-comatose condition until March 2d, when temperature runs down to 101° F., and he died at midnight of March 3, 1880.

During life this patient presented no trophic disorder of the bones, but at the autopsy the right hip-joint was found to be the

seat of beginning trophic disturbances, the head of the femur was beginning to undergo absorption, and would, evidently, have terminated in the same condition as the head of the femur in case No. 1.

These cases are undoubtedly arthropathies such as have been described by Charcot and others in locomotor ataxia and other diseases of the central nervous system. These arthropathies have so far been found to be most common in locomotor ataxia, and Charcot has given a good description of them, and in his lectures on nervous diseases figures a femur which resembles in many respects the femur in my case No. 1.

These lesions are characterized, as Charcot says, by rapid absorption of the bones.

Unlike arthritis, they present no evidence of efforts at repair; there are no osseous projections from the bones; no efforts at anchylosis; there may be swelling; effusion into the joints, but a complete absence of pain.

There is a disposition to deformities simulating fractures and luxations. The large joints are most usually affected, but even the small ones can be affected.

Charcot and his pupils have endeavored to determine the seat of the lesion in the nervous system which gives rise to these changes, and in a few cases have believed they found changes in the cells of the anterior horns, which might be the explanation of these trophic changes; but in other cases no such changes have been found, so the matter still remains an open question as to the part of the nervous system, disease of which causes these arthropathies.

Case No. 1, its beginning with lancinating pains (attributed to rheumatism, as is so often done), anæsthesia, and absent tendon reflex, approaches the cases of locomotor ataxia, and might cause one to think that it was a case of locomotor ataxia terminating in general paralysis. This is, however, I think, not the case; the patient had not the typical ataxia of

locomotor ataxia, and pains in the extremities are not at all uncommon in the prodromic stage of general paralysis. The absent tendon reflex shows, however, that there was sclerosis of the posterior columns. In cases two and three the tendon reflex was normal, and to judge from past experience in autopsies and microscopic examinations of the spinal cord ("Tendon Reflex in General Paralysis of the Insane," by Dr. J. C. Shaw, ARCHIV. MED.), the presumption is that the spinal lesions were very slight if there were any, and the brain in some part must have been the seat of the lesion giving rise to these trophic disorders. In the fourth case I have mentioned the tendon reflex was very much exaggerated, and it was evident that the spinal lesions were marked; the walk was somewhat spastic and unsteady.

In case three the disease of the inferior maxilia is rare as a trophic disorder, and in locomotor ataxia, where these arthropathies are most common, only once have these bones been reported as diseased. Vellin in *Union médic.*, Nov. 1879, reports two cases of trophic alterations of the maxillary bones in locomotor ataxia. It appears to me evident that we may expect to find trophic changes in the bones in a variety of diseases of the central nervous system, and that a number of regions of the brain as well as the spinal cord will give rise to these trophic disorders when they become diseased. It is a subject full of interest, and is still under investigation, and we may hope that before a great length of time has elapsed we may have more positive knowledge of these trophic centres.

THE INTIMATE NATURE OF TUBERCULOSIS; ITS TRANSMISSIBILITY, AND ITS PARASITIC ORIGIN.*

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THE human mind is not prone to change opinions and doctrines supposed to have been settled by the teachings of authorities. When, in 1873, I contradicted the cell-theory, I did not expect an immediate acceptance of the new view concerning the construction of the animal body; the less, as these views were based upon researches requiring unusually well-trained eyes and unprejudiced judgment. More especially in microscopy, a great many imagined discoveries and views, in the last forty years, have been proved false; and, as a rule, but a very brief period was required to show how unworthy they were of acceptance. My own views and discoveries, on the contrary, have very gradually gained ground during the last nine years. The discovery of the reticular structure of so-called "protoplasm" was, at first, ignored; but as early as 1878 E. Klein enumerated over a dozen good observers who recognized the reticulum partly in preserved, partly in living "protoplasm," and this number has considerably increased since. In 1880, S. Stricker, known to be the best micro-

* A paper read before the County Medical Society of New York, February 26, 1883.

scopist abroad, described the reticular, or trabecular structure in live saliva-corpuscles, and the form-changes of the trabeculæ, which are explicable only by admitting that they are formations of living matter. In my own laboratory I have had no difficulty, after the eye had been trained to see such delicate features, in demonstrating the presence of a reticular structure of amœboid corpuscles. Besides the saliva-corpuscles, I found the living blood-corpuscles of the crab of service. We obtain these by breaking off a limb of the animal, and transferring a droplet of the oozing liquid to the slide, covering the specimen with a thin covering glass, the edges of which have been previously oiled to prevent evaporation of the liquid.

S. Stricker, in 1880, also announced that in the cornea there exist no wandering and no isolated cells; that under favorable conditions we can observe the direct transformation of "basis-substance" into "protoplasm," and of "protoplasm" into "basis-substance." The preliminary publication of this subject I have translated and printed in my "Microscopical Morphology," because it plainly shows the coincidence of Stricker's views with my own, which I had published seven years previously. I lay stress upon Stricker's assertions, as he is known to be an extremely skilled microscopical observer, in contradistinction to the scores of microscopists who look into the instrument without ever becoming conscious of what they see. Quite recently, however, S. Stricker, in a public lecture delivered before his class, and printed in the *Wiener Medizinische Blätter*, Dec., 1882, announces that my assertions, regarding the life of basis-substance, were based upon the study of very clear and satisfactory specimens, which he himself had seen in 1873. Nevertheless, he needed six years' labor to be fully convinced of the correctness of my assertion that the basis-substance is really endowed with properties of life, equally

with the so-called "protoplasm." Stricker adds that the old-established theory, "*Omnis cellula e cellula*," must now fall to the ground.

Thus the most reliable observer abroad has corroborated my second statement, made in 1873, that in the animal body there exist no isolated "cells" within the tissues; that both the "cells" and the intercellular, or basis-substance, are pervaded by an extremely delicate reticulum of living matter, which at once comes to view if the glue-yielding portion of the basis-substance is liquefied, or, as Stricker calls it, is "*disgregated*." The method of A. Spina, published in 1879, furnishes us with a ready means of demonstrating the connections of the cartilage-corpuscles by delicate offshoots traversing the basis-substance. We simply place fresh cartilage in strong alcohol, cut the specimen in alcohol, and mount it in the same liquid. Specimens obtained by this method are so clear that any tyro can convince himself to-day of the correctness of the discovery which I made in 1872, that all cartilage-corpuscles are uninterruptedly connected with each other, and the basis-substance is pervaded by living matter but slightly less in amount than that in the cartilage-corpuscles themselves.

Based upon these researches, I have contradicted the cell-theory. Instead of assuming with R. Virchow that the animal body is a colony of individual cells, I have maintained that it is one continuous mass of living matter, mostly in a reticular arrangement; and that the difference in the tissues rests only upon the chemical and physical nature of the substance filling the meshes of the reticulum. I compared the highly-organized body of a mammal with a large amœba, in which the granules of living matter at the points of intersection are developed into what previously had been termed "cells." As in the amœba, there appear temporarily closed spaces, filled with liquid and con-

taining isolated granules of living matter; so the body of the mammal is traversed by closed spaces, known as blood- and lymph-vessels, in which, in a liquid, are suspended isolated corpuscles, the blood- and lymph-corpuscles. As soon as these facts and conclusions are approved and received, the cell-theory will be overthrown, for the individuality of the cell, upon which the cellular physiology and pathology mainly rested, will be destroyed. I bring these corroborations before the public in order to abolish the mistrust with which my assertions have been regarded for the last nine years. There are further statements of mine which, outside of my laboratory, have not yet been received. These, however, in a time not far distant, must meet with the approval of scientists, inasmuch as they are the results of direct observation, and are as well supported as the facts concerning the structure of single elements and that of the interstitial substances. I here allude to the constitutional differences in the aspect of single elements, their difference according to the amount of living matter present in the whole organism; upon which, as I shall presently demonstrate, rests the doctrine of the constitutional nature of different diseases, more especially of tuberculosis and scrofulosis.

With the new views concerning the construction of the animal tissues, the phenomena of inflammation are easily understood. It is quite interesting to note from the history of the doctrine of inflammation, how closely it was connected with and dependent upon the biological views for the time considered correct. The original views of humoral pathology, that inflammation is a disturbance of the vascular system mainly, and that the inflammatory elements, including pus-corpuscles are products of the exudate, yielded to the cellular pathological views. By the latter no stress was laid upon the part taken by the blood and the blood-vessels.

The whole process of inflammation was considered to start and run its course in the tissue-elements, the "cells," which alone were thought to be endowed with life, and by their proliferation and multiplication should have produced the vast amount of inflammatory or pus-corpuscles visible in an inflamed tissue. This theory originating with Virchow, was contradicted by Cohnheim, who considered the inflammatory infiltration, the accumulation of pus-corpuscles, to be due only to an emigration of colorless blood-corpuscles, so-called "leukocytes," while the mother tissue and its constituent elements perished altogether. In the latter view, upheld even in our days by a number of German pathologists, nothing was alive in the body except the colorless blood-corpuscles, and it was only upon irritation that they would react by their emigration from the capillaries and small veins. An untenable view surely, but one which, if correct, would save us the trouble of studying the minute anatomy of tissues which were about to perish and disappear in a mass of colorless blood-corpuscles.

S. Stricker deserves credit for having, since 1870, strenuously opposed the assumptions of Cohnheim. Stricker proved that in all the previous ideas concerning the process of inflammation there was some truth, but that only in the combination of these theories full truth was to be found. He demonstrated the necessity of the presence of blood-vessels and nerves for the inflammatory tissue; he proved the correctness of Virchow's assertion concerning the proliferation of the tissue-elements and their offshoots, without endeavoring to deny that in certain forms of the inflammatory process an actual emigration of colorless blood-corpuscles takes place. He proved the correctness of the hypothesis of John Hunter, that inflammation essentially consists in a recurrence of the juvenile condition of the tissues. Since 1880, Stricker has advanced a step farther, and now re-

ceives my statement that at first a mere liquefaction or disintegration of the basis-substance takes place, leading, in a comparatively short time, to a reäppearance of the living matter previously concealed therein. Recently he even ascribes the apparent amœboid motion of "protoplasmic bodies" in the inflamed tissues to a rapid dissolution and re-formation of the basis-substance.

In 1873, I stated that in inflammation of the connective-tissue varieties at first a liquefaction of the basis-substance occurs, whereupon the medullary or embryonal elements, which originally shared in the formation of the basis-substance, simply reappear. Where before was visible only a central corpuscle, surrounded by a certain amount of basis-substance in the shape of a territory, after the dissolution of the latter a number of elements make their appearance, not being newly formed, and not being due to the proliferation of the central corpuscle, but simply made visible by a change in the refractive power of the formerly solid, and afterward liquid, interstitial substance. A real new-formation of inflammatory elements takes place in the course of the inflammatory process by an increase of the amount of living matter of the medullary corpuscles, starting not only from the central nuclei, but from any granule of living matter, *i. e.*, any point of intersection of the reticulum of living matter. Thus the original connective tissue is replaced by, and transformed into, inflammatory corpuscles, the sum total of which furnishes the condition known as the inflammatory infiltration. I further maintained, that at first all the newly appearing and newly formed elements remain connected by means of delicate thread-like offshoots, and that the tissue, although greatly changed, does not cease to be a tissue. So long as no new elements have been formed, an immediate re-formation of basis-substance may take place, and the inflammatory process terminate in

the shortest and most perfect way, by what is known to the pathologists as "resolution." After a large number of inflammatory corpuscles have formed, a reëstablishment of basis-substance may occur; but the bulk of the inflamed tissue being augmented, the result would be hypertrophy or hyperplasia. Thus the anatomical foundation of the termination of inflammation was discovered, for the general designation of which the term "plastic" or "formative" was long since adopted by the pathologists and clinicians.

If, on the contrary, the mutual connection of the inflammatory elements be destroyed, perhaps merely mechanically by the exudation, the broken elements themselves will be suspended in a serous liquid, and will furnish the substance for the pus-corpuscles. Pus, we know, is no tissue; pus, I said, is a broken-down, disintegrated tissue, and the pus-corpuscles are, in the main, products of the inflamed tissue itself. The difference between inflammatory elements, constituting a tissue, and those composing an abscess has not yet been recognized by Stricker, who believes all inflammatory corpuscles to be pus-corpuscles.

In epithelial tissue the process of inflammation runs a very similar course. In single epithelia, provided they still possess the properties of life, by an increase of the living matter, new inflammatory corpuscles arise in a manner, known since Remak as the endogenous new-formation. Should the newly formed elements wander actively from their place of origin, or be thrown out by active contraction in the unchanged living matter within the epithelial body, each newly formed element will represent a pus-corpuscle, and its previous location within the epithelium be marked by a so-called vacuole. Coalesced epithelia, in which the cement-substance has been liquefied, may give the aspect of multinuclear bodies, and subsequently divide into medullary or inflammatory corpuscles, fully identical with those

sprung from connective tissue. Doubtless such medullary corpuscles may be supplied with, or transformed into, basis-substance, and furnish newly formed, usually fibrous, connective tissue, the shrinkage of which causes the diminution of the bulk of glandular organs, for instance of the liver, the kidneys, in the process known as "cirrhosis" of these organs. The epithelia are destroyed by the production of inflammatory corpuscles, which, so far as the new-formation of a cicatricial, dense connective tissue is concerned, do not differ from inflammatory corpuscles arisen from the original, interstitial connective tissue.

The blood-vessels, present only in connective-tissue formations, deserve special attention. We know, mainly through Stricker's researches, that they were originally solid cord- or club-like formations, which later, by vacuolation, become hollowed out, their walls being differentiated into endothelia. In avascular tissues which greatly surpass in bulk the cornea, or in tissues very scantily supplied with blood-vessels, such as the fully developed cartilages, no inflammation can be brought about, even after the most intense irritating agencies, such as red-hot iron. In vascularized tissues, higher degrees of the inflammatory process lead, at a certain stage, to a destruction of a large number of blood-vessels. This process of destruction is, in all essential features, a rejuvenescence of the vessels, *i. e.*, they are first transformed into solid cords and afterward split into inflammatory elements, identical with those which arise from the surrounding connective tissue. Every tissue invaded by inflammation of a higher degree assumes, in an advanced stage of the inflammation, a pale gray color, owing to the lack of blood-vessels. As soon, however, as the inflammation abates, a re-formation of the vessels takes place, either equalling the normal supply of the tissue, or in a number smaller than that of the healthy tissue. The latter feature

is observable mainly in hyperplastic or hypertrophied tissues, and in the cirrhotic condition of glandular organs, the result of subacute inflammation. Hyperplastic, cirrhotic, and cicatricial connective tissues, as a rule, are but scantily supplied with capillary blood-vessels.

Should the newly-formed inflammatory corpuscles break apart, become isolated, and in consequence cease to be a tissue, the result will be an abscess, wholly destitute of blood-vessels. The sequence will be the same, whether the corpuscles originated from connective tissue and former blood-vessels, or from epithelia. Around the pus-filled cavity, owing to a reactive inflammatory process, a new formation of connective tissue takes place, in some instances freely, in others, scantily provided with blood-vessels. This constitutes the wall of the abscess, and was formerly described as the *membrana pyogena*, but is under all circumstances a secondary formation following the appearance of the abscess.

Observation shows that a re-formation of blood-vessels after an inflammatory process occurs only in otherwise healthy persons, of a good constitution ; persons, therefore, whose body contains a large, or at least fair amount of living matter. The blood-vessels being originally bulky, solid cords of living matter, obviously an outgrowth of this matter, sufficient for the production of blood-vessels, can take place only in an organism richly supplied with living matter. Persons, on the contrary, of a weak constitution, being provided with but little living matter in their organism, are unfit for the reproduction of vessels lost in the process of inflammation. Such individuals are termed tuberculous or scrofulous. Whenever an inflammation sets in in any organ of the body, oftentimes depending upon trifling irritations, the so-called catarrhal processes, the course taken by this morbid process is the same as in persons of a good con-

stitution, with this exception only, that the lost blood-vessels are not re-formed. Consequently the inflammatory foci, deprived of their nourishing vessels, will be composed of shrivelled elements, which later break apart, become disintegrated, and assume a yellow color, becoming crumbly and friable; in short, take on the condition known under the term "cheesy," and thus represent a disintegrated tissue, for the general designation of which the word "tubercle"' is used. Tubercle, therefore, is the result of an inflammatory process, in the course of which the blood-vessels of the inflamed tissue have been destroyed and never re-formed. Tubercle is an avascular product of inflammation. As the process is precisely the same as in the formation of an abscess, only of a very much lower grade and slower course, the designation of the tubercle as a *dry abscess* seems to be fully appropriate. It makes no difference what variety of vascularized tissue was the original seat of inflammation, the result will always be the same. We know that catarrhal inflammation of the lungs leads most frequently to the formation of tubercles, but the same process occurs quite frequently in serous and mucous membranes, also in the latter case with a rapid destruction of the cheesy foci in the shape of ulceration. Bony tissue is known to be often the seat of cheesy foci as the result of osteitis, establishing the condition clinically known as caries. In the skin such cheesy foci constitute the disease designated lupus, etc. The lymph-tissue, bearing also the misnomer "adenoid tissue," being, in its follicular formations, especially scantily supplied with blood-vessels, is likewise extremely prone to inflammation and the production of cheesy foci, generally termed scrofulous. These formations, although differing in their clinical aspect from tuberculosis of other organs, nevertheless are fully identical with tuberculosis. In fact, there is no vascularized tissue in the organism enjoying an

immunity from tuberculosis, and as it is the connective tissue exclusively which holds blood-vessels, the issue of the inflammatory process will, under all circumstances, be connective tissue. In this view of the process of tuberculosis the tubercle ceases to be a "deposit" in the sense of Laënnec and the humoral pathological school, but is an inflammatory infiltration of a vascularized tissue deprived of its blood-vessels. The tubercle thus will be deprived of all specificity, and will be regarded as a purely constitutional disease.

The process of tuberculosis, although starting with the erroneous view, that it consists in a "deposition" from the blood, was accurately described by Rokitansky. With him the endless varieties in the manifestations of the disease were mainly due to the time required for the development of tubercles, viz., whether the process ran a slow, chronic course; or a chronic course with more or less frequent acute recurrences, the subacute form; or, lastly, an acute form, consisting mainly in the appearance of minute, so-called miliary tubercles. My own researches, based upon the examination of three hundred bodies of persons dead of tuberculosis, were in full harmony with the conception of Rokitansky.

In the lungs tuberculosis appears as a chronic, a subacute, and an acute disease. The chronic or, preferably, localized tuberculosis of the lungs is situated usually at the apices, and consists of scattered inflammatory foci of moderate size, around which, owing to a reactive inflammation, new, dense connective tissue is formed, resulting in the induration, or cirrhosis, of the lung-tissue. The size of the original tubercles is certainly of less consequence as to the sequelæ of the process; it is mainly the number of the foci, and the lack of recurrent formations of tubercles, which determine the degree of the subsequent induration of the lung-tissue. This form is specially prone to heal either by obsolescence,

the new-formation of a basis-substance within the avascular tissue of the tubercle, or by fatty degeneration and deposition of calcareous matter in the tubercle. Observation plainly demonstrates that a genetic separation of the tuberculous nodule from the tuberculous infiltration is not admissible; that the later metamorphoses depend materially upon the circumstance whether or not the nodule or node remained a tissue. Further, we see that the possibility of an inflammatory focus becoming callous, depends greatly upon its size, and that the solidification of the lung-tissue may take place either by the formation of a circumscribed capsule, or as a diffuse induration, all of these being secondary occurrences. The second form of tuberculosis of the lungs is the subacute or dispersed tuberculosis, characterized by continuous recurrences of tubercles, even in an already formed connective-tissue capsule, and simultaneous exudation into the older cheesy focus, and ulceration of the invaded tissue. Here we are again satisfied that there is no essential difference between a nodule and an infiltration, for either may be transformed into a crumbly mass and become softened. The ulcerative destruction of the lung-tissue is different merely in its acuteness, that is, according to whether a number of scattered nodules are breaking down at different times, or whether an infiltration is continually softened and simultaneously increasing in size at its periphery. The surrounding lung-tissue, in all forms of softening and local necrosis, is evidently involved only in a secondary manner, therefore is in a reactive, acute, or chronic, inflammation. A third form of tuberculosis of the lungs is known by the name of the acute or miliary tuberculosis, consisting in a nearly simultaneous formation of innumerable nodules, the size of a millet-seed, or even less, throughout the entire lung-tissue, and in other organs. This form was especially attributed to the presence of a cheesy focus,

either in the lungs, in lymph-ganglia, or any other part of the body, whose contents being taken into the vascular system, would produce innumerable small foci of tuberculosis, in an embolic manner. My own observations, however, fully coincide with those of Buhl, that in ten per cent. of cases of general miliary tuberculosis, which almost invariably terminate fatally in a comparatively short time, no cheesy focus whatever can be discovered in the organism. A fourth variety of tuberculosis occurs in the lungs in the form of tuberculous pneumonia, starting with the features of an ordinary lobar or croupous pneumonia, with subsequent destruction of all blood-vessels in the inflamed portion of the lung, and transformation of such portions into a half-dry, cheesy mass.

Microscopical examination of tuberculous lungs in any one of the above-described varieties demonstrates their complete identity in the minute anatomical features. All of them at first exhibit the features of catarrhal pneumonia, an infiltration of the walls of the alveoli with inflammatory corpuscles, an engorgement of the alveoli with such corpuscles, and a few unchanged, or slightly changed epithelia; the presence of a serous or albuminous exudation, and the extremely small amount, or entire absence, of coagulated fibrine. The most striking feature, in all instances, is the lack of blood-vessels, and to such an extent, that although in all forms the tubercle is surrounded by vessels, some of which may penetrate its most peripheral portions, the mass of the tubercle is completely destitute of vessels. This feature, under the microscope, at once enables us to tell positively whether or not a tubercle is before us, in the lung-tissue, as well as in any other part or tissue of the body. The breaking down of the walls of the alveoli is, as a rule, so complete, that only a frame of elastic fibres is left as an indication of the former alveolar wall. These fibres, in a sub-

sequent softening process of the tubercle, may be eliminated with the sputa and appear under the microscope, furnishing positive proofs of an ulcerative destruction along the aërial passages; together with shrivelled and disintegrated inflammatory corpuscles, if the ulcerative process be tuberculous in nature.

The process of tuberculosis in the lymph-ganglia is of the same nature. Here it likewise appears, either as a diffuse infiltration of the ganglion, if the original inflammation has invaded the ganglion *in toto*, or as small circumscribed infiltrations, never, of course, nodules (*tubercula* in the proper sense of the word), if the inflammatory foci were from the beginning disseminated. Should the tuberculous focus be softened by secondary inflammation of the surrounding vascularized tissues, an abscess will form, which breaking open or being cut into, yields the characteristic serous pus, with intermixed cheesy flakes and crumbs. Subsequently ulceration takes place in and over the tuberculous lymph-ganglion, with the characteristic features of a "scrofulous" ulcer, running a markedly slow course, and terminating in the production of an extensive, irregular, pigmented scar. Although scrofulosis is a prevailing disease of childhood, and persons prone to scrofulosis in their youth sometimes remain exempt from tuberculosis of the organs, yet the process must be considered as identical with tuberculosis, both from the pathological and microscopical appearances.

From my description, it plainly follows that I draw no essential distinction between tuberculous infiltration and a tubercle nodule, both being the products of an inflammation. This is contrary to the views held by Virchow, who considered the chronic and subacute form of tuberculosis of the lungs as the result of inflammation; the miliary tubercles, on the contrary, as the products of a new-formation,

a sort of tumor, composed of granulation-tissue. He originated the idea that chronic tuberculosis of the lungs is only cheesy pneumonia, while the miliary tubercle is the tubercle proper, being really a tubercle in shape. Niemeyer, later, perfected this theory into a clinical doctrine, according to which a person with cheesy pneumonia, whose lungs are in part in the condition of induration and cirrhosis, in part ulcerated and destroyed—individuals, therefore, suffering from phthisis—might become tuberculous, *i. e.*, attacked by acute miliary tuberculosis. Most of the clinicians have, without further discrimination, accepted this unscientific theory, being very much afraid lest patients with chronic or subacute cheesy pneumonia might become tuberculous. That such views do not stand the proofs of pathological research is obvious; and to-day pathologists begin to return to the old-fashioned and for a time abandoned views, that all forms of tuberculosis are, in the essentials, identical.

In my conviction, tuberculosis is a thoroughly constitutional disease, the features of which are marked in the individual from birth to the end of life: the pale complexion, the tall frame, the narrow chest, the ill-developed muscles, the small heart, the thinness of the arteries, the ease with which hemorrhage takes place, for instance, frequent bleeding from the nose, chlorosis, and a number of other features, are well known to all practitioners. It is further known that such individuals show a very marked tendency to slight so-called catarrhal processes, mainly in the mucous membranes of the nasal, pharyngeal, laryngeal cavities, the bronchial tubes, the lungs, the stomach, and intestines. So-called colds, catarrhal inflammation of the aërial passages, and diarrhœa are the most common occurrences, and the lymph-ganglia within the range of the inflamed tissue are extremely prone to swell, and eventually become tuberculous, or, as the clinical expression says, "scrofulous."

After I had discovered the fact that the delicate reticulum within each single element, constituting the organism, is the living matter proper, greatly varying in amount in different individuals, I turned my attention more particularly to the appearance of the living matter in pus- and colorless blood-corpuscles and their relation to the general constitution of the individual, as ascertained by the characteristic appearance to the naked eyes and by reliable family histories, obtained mostly from intelligent physicians who attended my laboratory. After several years of careful observation, the fact became settled in my mind that the marked differences observed in the appearance of the above-named corpuscles under the microscope were in accordance with the constitutional features of the persons who furnished these corpuscles.

Obviously, what we call a good constitution, depends upon the presence of a large amount of living matter in the bulk of the body; on the contrary, what we call a poor, tuberculous, phthisical, or scrofulous constitution, is due to a deficiency of living matter. Pus- or colorless blood-corpuscles, formed in a person of an excellent constitution, will, under the microscope, appear homogeneous or nearly so, indicating that these corpuscles contain a large amount of living matter. No nucleus, and scarcely any structure, is discernible in such corpuscles. Coarse granulation of the corpuscles, *i. e.*, large points of intersection with short indistinctly marked threads connecting the granules, are features of a good constitution; the nucleus, likewise a formation of living matter, may be invisible in such corpuscles, owing to their coarse granulation, or be present in the shape of a solid lump, without a frame in its interior, and without a nucleolus. A middling constitution is marked by less coarse points of intersection in the body of the corpuscle and by a homogeneous or coarsely granular nucleus; the reticulum will, in

such corpuscles, be easily recognizable with the microscope. A poor constitution will become evident if a corpuscle be, with lower powers of the microscope, finely granular, with higher powers distinctly reticular, and exhibiting a very distinct nucleus, enclosed by a well-marked shell, and having in its interior a few coarse granules, all inter-connected by means of delicate filaments. Living corpuscles of the latter variety will, under suitable conditions, exhibit the most active changes of form and locomotion, and by intense contractions of the reticulum easily burst and become disintegrated and form into clusters of granules, more especially upon the approach of death.

As to the extremes described in pus- and colorless blood-corpuscles, there can be no doubt left. The innumerable shadings between the best and the poorest corpuscles, of course, admit of different interpretations according to the acuteness of vision of the observer and his clinical experience. I have repeatedly urged upon intelligent practitioners to take these features into earnest consideration, as I myself have no opportunity for testing them in hospital practice. Should all views prove to be correct, as laid down in my recently issued work, "Microscopical Morphology," we would unquestionably obtain, for the first time, an anatomical foundation for our clinical work.

The views, upon which, up to our day, rested the explanation of different diseases in different individuals, were unsatisfactory enough. Humoral pathology suggested for this purpose the "dyscrasia," which meant a "bad mixture" of the liquids of the body, particularly of the blood. Every disease was based upon a certain dyscrasia. We have even at present so little positive knowledge of the chemistry of the blood, that Virchow's attempts to abolish the theory of "dyscrasia" may be considered perfectly legitimate. Virchow himself replaced the "dyscrasia" by the "diathesis,"

which had no bearing upon the liquids, but only upon the tissues, more especially the "tissue-cells," considered at that time as the only seats of life. In Virchow's definition the "diathesis" meant a certain vulnerability, a certain debility of the tissue, a certain lack of resistance against injuries, etc.,—a thoroughly hypothetical assumption for which there existed no anatomical foundation whatever. It was very easy to explain the cause of diseases by a certain "diathesis," and this explanation was fashionable during the last thirty years, sparing the physician all further trouble of research and thought. As the "diathesis" seemed so unsatisfactory, Virchow himself was forced to resort to another explanation, which he termed "predisposition." Anybody might acquire a disease in consequence of a preexisting "disposition" to it, and when he dies, he dies because he was disposed to die. "Predisposition" was employed to account for many different pathological processes, but upon second sober thought we must admit that it did not explain any thing.

When I discovered the constitutional differences by the aspect of single elements of the organism, traceable not only in those of the normal and pathological liquids, the colorless blood- and pus-corpuscles, but likewise in those of the different tissues, I thought that for the first time something positive was offered for the explanation of the etiology of diseases, something within our grasp, something that everybody could see and deal with as an anatomical feature. "Dyscrasia," "diathesis," "predisposition," I thought, should be put together in one category, and altogether discarded, although they had been representatives of medical wisdom for centuries.

I found that even the degree to which the organism was lowered in its constitutional amount of living matter could be told by watching pus-corpuscles, for instance, in urine. If

an originally good constitution was present but broken down by some chronic ailment, in addition to the coarsely granular pus-corpuscles, finely granular ones were invariably present; the more finely granular and the more numerous, the more the individual was debilitated. I thought that emaciation of the body, loss of strength, and the like, directly rested upon a waste or loss of the living matter, as shown by the pus-corpuscles. All this is sketched only in rude outlines, and very hard conscientious work is yet required before we will be justified in basing positive statements concerning the relation between the appearance of single pus-corpuscles and constitutional ailments. Should this ever be accomplished, no doubt we would gain firm ground for a medical achievement far surpassing in value the so-called curing of diseases, namely, their prevention.

Observation shows that all elements involved in the formation of a tubercle are finely granular, *i. e.*, scantily supplied with living matter. So long as the inflammatory new-formation is going on, we not infrequently meet with a few elements showing a somewhat coarser granulation, particularly epithelia in endogenous new formation. There are seen also small lumps of living matter, compact and homogeneous, the first appearance of newly-formed elements, which afterward grow into vacuoled, and finally into nucleated, corpuscles. Such lumps, however, are few in comparison with the large number of bulky globular formations, having the aspect of "hæmatoblasts," filling the inflammatory focus in persons of an extraordinarily good constitution. If we examine pus-corpuscles in the urine of individuals with a marked phthisical taint, we will see none but such as are finely granular, distinctly nucleated; and in a droplet of blood, taken from a minute prick of the skin of such an individual, only finely granular bodies will be met with, all of them being but scantily supplied with living

matter. *From this observation we must conclude that either tuberculosis is a purely constitutional disease, or, if such a thing as a directly inoculable virus of tuberculosis exists at all, it finds a favorable soil for development only in individuals of a poor constitution.*

The next question for our consideration must be, Is tuberculosis an infectious, transmissible disease? This question can be answered in two ways, viz.: by clinical observation of physicians, and by experiments made on animals. In neither way has there been obtained a definitive or conclusive answer. In my laboratory I meet with many bright physicians, considered as unprejudiced observers, and whenever I place the question before them, whether or not they are convinced of the transmissibility of tuberculosis, some say that no such thing occurs; others, on the contrary, maintain that it does. When I inquire of the latter on what ground their experience rests, they usually tell me stories something like the following. An apparently healthy man, in whose family there is no history of phthisis, marries a woman from a phthisical family. The woman dies, after a few years, with tuberculosis. Soon after her death the man begins to cough, to emaciate, and after several years he also dies with the symptoms of tuberculosis. When I inquire whether another interpretation of these facts would not be admissible, namely: that the man, by being confined to the sick-bed of his wife; by inhaling close air for months in the sick-room—fresh air being mostly cut off in such cases for fear of "catching cold";—by sleepless and restless nights, and, if he loved his wife, by the mental worry, could be broken down in his health to such an extent that he likewise might become a victim of tuberculosis; most of the physicians admit that such an explanation is admissible. Unquestionably, however, there are physicians thoroughly convinced of the infectiousness of tuberculosis.

Toward the end of the last century, when tuberculosis was greatly prevailing on the European continent, the physicians were pretty well satisfied that the disease was contagious. In Vienna, where there is a great deal of tuberculosis, during the most flourishing period of the medical school, between 1840 and 1865, when the best pathologists and clinicians were teaching, nobody ever thought of the infectiousness of tuberculosis, the disease always being regarded as an entirely constitutional one.

Villemin's experiments, who, with positive results inoculated the sputa of tuberculous men into rabbits and guinea-pigs, created great excitement in Vienna and Berlin; but repeated experiments, chiefly in the latter city, up to 1870, have proved almost conclusively that it is not the material inoculated which renders the rabbits and guinea-pigs tuberculous. Waldenburg, Cohnheim, Fränzel, and a score of others have demonstrated, that under certain conditions in these animals, general tuberculosis could be induced by almost any thing introduced under their skins; for instance, a piece of gutta-percha, sheep's wool, glass-particles, paper scraps, nay, in some cases the slightest injury done to the skin, was sufficient to cause the animals to die of tuberculosis. It was found that rabbits and guinea-pigs, more particularly the latter, were the most favorable objects for experiments; that horses, dogs and rats could be infected only exceptionally; cats never. These animals sometimes died of tuberculosis after injection of finely granular anilin colors into the vascular system, and the tubercles were found crowded with anilin-granules.

In Vienna many experiments were attended with precisely the same results as in Berlin. Rabbits kept in laboratories, in cages, in cellars, and poorly fed, to be sure, promptly reacted after the infection, and were invaded with general tuberculosis. Rabbits, on the contrary, kept in yards,

having plenty of green food at their disposal, and allowed to enjoy fresh air, could be experimented upon in any way, even with inoculation of tuberculous sputa, and, nevertheless, they never showed any signs of tuberculosis; on the contrary, they thrived remarkably and grew fat.

Rabbits and guinea-pigs have usually a poor constitution, this being a characteristic of herbivorous animals in general, viz., the elements of their tissues are finely granular, scantily supplied with living matter. Such animals, if kept in the cellar, after a few days became affected with diarrhœa, which necessarily lowered their constitution still more. Rabbits and guinea-pigs are the most markedly tuberculous of all animals, for with them we rarely succeed in obtaining even regular pus, after operations of any kind; but, as a rule, only a half-dry, crumbly mass, closely resembling the cheesy mass in tuberculosis.

What have all the experiments for the transmission of tuberculosis proved so far? Certainly, that none of the experimenters could be accused of having rendered the animals tuberculous; but that it was the "predisposition" of certain animals, or, as we would express it, their constitution which made them fit, after injuries of any description, for the production of avascular, cheesy, inflammatory masses. Cats are the most unresponsive creatures to these experiments; they never become tuberculous, and their constitution is, as we may easily ascertain under the microscope, really excellent. And, nevertheless, animals of all kinds, apes, elephants, parrots, and even lions die of tuberculosis in menageries, being kept in cages and exposed to all obnoxious influences of the climate. Negroes and mulattoes, who very rarely become tuberculous in the South, often die of this disease after living in the North. Apparently healthy men become tuberculous in prisons; soldiers in the, mostly very unsanitary, caserns, or after having been

broken down by exhausting diseases, such as malarial poisoning, or typhoid fever, or syphilis. Others never die of tuberculosis, no matter what deprivations they may suffer from.

The most striking experiments made in Germany were those in which small quantities of tubercle-matter were transferred into the anterior chamber of rabbits' eyes, and some time afterward tubercles developed in the iris. It was claimed that no other but tubercle matter would produce such a result. Quite recently, however, experiments were made in Vienna, by transferring pus from syphilitic ulcers or vegetations into the anterior chamber of rabbits' eyes, and the result was, as good observers claim, tuberculous iritis.

The experiments have but little value so long as they prove successful only on rabbits and guinea-pigs, and very exceptionally on dogs. If Klebs maintains having rendered animals tuberculous by feeding them with the milk of tuberculous cows; if Rindfleisch claims that every one of us is tuberculous, the difference being that in some the disease breaks out, and in others it does not; and if Billroth asserts that a tuberculous mother makes her baby tuberculous by cleansing its nose with a handkerchief that she had previously used, it certainly takes a certain "predisposition" to make statements of this kind, and, still more, to believe them.

Quite recently Koch, of Berlin, has made the brilliant discovery of a bacillus in the sputa of persons suffering from tuberculosis of the lungs, and characterized by taking up certain anilin dyes (methylen-blue, gentianin, and fuchsin, etc.). He by culture of the bacillus produced its multiplication, and was successful in rendering rabbits, guinea-pigs, and rats tuberculous by inoculation of the fungus. That this bacillus really does exist cannot be doubted, and experi-

ments by Balmer and Fränzel and others have clearly demonstrated that it has both diagnostic and prognostic value: diagnostic, inasmuch as the bacillus is present only in the sputa of persons affected with tuberculosis of the lungs, mostly in its chronic and subacute forms; and prognostic, inasmuch as the disease takes a more rapid course, the more numerous the bacilli in the sputa are. The bacillus was also found in the middle of tubercle-nodules, although it is strange to learn that the numbers are small on the inside of tuberculous cavities, in comparison with the enormous quantities in the sputa. Some claim to have been successful in finding the same bacillus in the dejecta and in the urine, if the corresponding organs were affected with tuberculosis. That the same bacillus with the same reaction with anilin colors was found also in the stagnate water of ditches and pools, will make no serious objection to its pathological significance.

Koch is known to be an extremely skilful and conscientious worker, and the correctness of his assertions cannot be doubted. The results of his experiments, gained by inoculation of the bacillus, are greatly marred by the sources of error alluded to before. We must familiarize ourselves with the possibility that in our bodies, especially in the liquids, there are suspended innumerable germs of the lowest organisms, invisible, to be sure, even to our best modern optical apparatus, and, therefore, hypothetical. The idea of being "sewers of the outer world" is not a pleasant one. The possibility, however, stands, that the germs of, nobody knows, how many different low organisms are floating about in our living organisms, and upon finding a favorable soil for development, at once begin to grow and multiply, and eventually destroy life. There are cases on record in which putrefaction took place in the uninjured articulation of an apparently healthy man; in the pus of osteo-myelitis, micro-

cocci and bacteria were found in enormous numbers; the same in ulcerative endocarditis. All these and many other facts become understood only upon the ground before mentioned. The possibility must be taken into consideration that the low organisms are in no causal relation to the diseases, but simply appear in a secondary way, a certain pathological process, more particularly an inflammatory one, furnishing a favorable soil for their development. It is possible also that the tubercle-bacillus, or rather its germs, come to prosperity only in the cheesy masses so characteristic of tuberculosis, and there is no causal connection between tuberculosis and the bacillus.

In the momentary standing of our experience, the presence of a fungus in tuberculous masses will not explain the fact that some animals are rendered tuberculous with great ease, others only exceptionally, and still others never. Nobody who sees the ravages of the fungus of tinea tonsurans and favus on the skin, will doubt that fungi may produce quite severe inflammations if penetrating the tissues. Here the causal relation between the fungus and the disease is apparent. Not so in tuberculosis. Future experiments and observations will, in all probability, settle the question whether the bacillus is the real cause of tuberculosis, or whether it is a merely incidental occurrence, always, of course, valuable for diagnostic purposes; or whether in animals or men of a poor constitution the fungus causes the inflammation with the disastrous effect of destruction of all blood-vessels and subsequent shrinkage of the constituent elements.

NEW BOOKS AND INSTRUMENTS.

Handbuch der Electrotherapie. Von Dr. Wilhelm Erb, Professor au der Universität zu Leipzig. Verlag von F. C. W. Vogel, Leipzig, 1882, pp. 693.

Die Electricitat in ihrer Anwendung auf pratische Medicin. Von Dr. Moritz Meyer, Geheimem Sanitätesrath und pract. Arzt zu Berlin. Fourth edition, entirely revised and enlarged. August Hirschwald, Berlin, 1883, pp. 632.

The first of the above-named works on electro-therapeutics forms the third volume of Ziemssen's "Handbuch der allgemeinen Therapie." As it is the first systematic work on this subject which has appeared from the pen of its eminent author, who has been, however, thoroughly identified with the developement of the scientific use of electricity in its application to medicine, it will certainly be welcome to all readers of German who are at all interested in this subject. The author has less of the verbosity so common with German writers; he confines himself to his subject, and is clear in his statements, appearing also to have in mind the practical rather than the transcendental features of his topic. His candid and careful statements, his enunciation of systematic methods, and the conservative tone of his teaching have resulted in the production of a book which will have a good influence on the study of medical electricity: exerting, it is to be hoped, a counteracting tendency to the teachings of many whose enthusiasm has overpowered their scientific methods; and, on the other hand, holding up the facts to those who are disposed to relegate electricity, as a therapeutic or diagnostic agent, to charaltans.

The work is divided into a general, and a special part, both of which are presented in the form of lectures. Part I consists of divisions on the history of electro-therapeutics, electro-physics, electro-physiology, electrical examination, electro-diagnosis, gen-

eral electro-therapeutics. The special part consists of divisions on diseases of the brain, with a supplement on electro-therapeutics of the psychoses; disease of the spinal cord, diseases of the peripheral nerves; paralysis and atrophy, pain, neuralgia, and neuralgiform affections; spasm and contraction; anæsthesia; diseases of the cervical sympathetic vaso-motor; trophic and related neuroses; general neurosis; central and other functional neuroses; diseases of the organs of special sense; diseases of the locomotory apparatus; of the glands, the thoracic organs, and the alimentary apparatus; diseases of the urinary and genital apparatus. In the special part, one hundred and seventy-one cases are recorded, a large number of which are from the author's practice; they are all briefly reported. One of the most valuable features of the work consists of a bibliography pertaining to the subject treated in each division.

Professor Erb does not attempt to conceal the difficulties which underlie the acquisition of a practical knowledge of the uses of electricity in the diagnosis and treatment of diseases; on the contrary, he refers again and again to the necessity of painstaking effort, uniformity of method, and a certain amount of scepticism respecting the results of treatment. A portion of his work will be recognized by those who have read his volume on diseases of the peripheral nervous system, in Ziemssen's "Encyclopædia of Practical Medicine," that, having reference to the degeneration reaction, and to the histological changes occurring when degenerative processes affect the nerves and muscles.

The second book on electricity in its application to practical medicine, is the fourth edition of a work whose first edition appeared in 1854, the second in 1860, the third in 1868. The prefaces to these different editions are an indication of the great changes which the subject has undergone in the last three decades. In its present form, although containing a less number of pages than Dr. Erb's work, its larger-sized and more closely printed pages make it a work of greater volume. A large number of cases (194) are reported, many of which are extended to great length. In the consideration of diseases, matters hardly relative to electro-therapeutics are considered to such a degree as to make the volume appear as a general work on clinical medicine rather than as a special work on medical electricity. Extensive changes have been made, particularly in regard to electro-diagnosis. The author has freely quoted from Dr. Erb's work, just cited, which appeared but a few months before the publication of the volume in question.

The arrangement of the work is as follows: historical review of the application of electricity to medicine; on the action of the electric current in general; on the electro-motor characteristic of the animal body; on the action of the electric current on the organs and tissues of the animal body; on apparatuses constructed for special therapeutical objects; method of application of the faradic and galvanic currents; electricity in its application to anatomy physiology, and pathology; electricity in its relations to the diagnosis and prognosis of paralysis; electricity as a curative agent. Under the latter heading, which comprises one half the volume, are three chapters on electricity in its application to medicine, to midwifery, to gynæcology, and surgery, respectively.

Both of the works mentioned are exhaustive treatises on electricity in its relations to medicine and surgery, and as works of reference are exceedingly valuable, but as text-books for the student or general practictioner they are too voluminous. Erb's work, however, is less open to this objection, and if his first, or general part, be taken alone, it would form a very thorough and perhaps not too extended volume for general teaching. In this connection we will refer to an American work on this subject, which we reviewed in this journal, on the appearance of its first edition: Bartholow's "Medical Electricity." A second edition has appeared, with a number of improvements, embracing the more recent views on diagnostic methods, electrical units, etc., making this one of the best text-books on the subject which has appeared in English. Its moderate compass is an advantage. [W. R. B.]

Microscopical Morphology of the Animal Body in Health and Disease. By C. HEITZMANN, M.D., late Lecturer on Morbid Anatomy at the University in Vienna, Austria. With 380 original engravings. New York: J. H. Vail & Co., 1883.

The above comprises the title-page of an octavo volume of eight hundred and fifty pages, in great part in small print. The work of the publishers deserves much praise, and if they have borne any portion of the cost of illustration, they are entitled also to the thanks of students and teachers of pathology.

The book begins by a very comprehensive table of contents; but it has no index of any description at its end—a serious fault in any large book, and totally inexcusable in a work which aims to be one of reference. Since the general plan and scope of this work are only adequately understood by the table of contents, we give the headings of its twenty-two sections in the order in which they appear:

I. Methods—II. General Properties of Living Matter—III. Arrangement of Living Matter in "Protoplasm"—IV. Phases of Development of Living Matter—V. Structure and Origin of Colored Blood-Corpuscles—VI. Tissues in General—VII. Connective Tissue—VIII. Muscle-Tissue—IX. Nerve Tissue—X. Epithelial and Endothelial Tissue—XI. Inflammation—XII. Tuberculosis—XIII. Tumors—XIV. Skin—XV. Digestive Tract—XVI. Teeth—XVII. Liver—XVIII. Respiratory Tract—XIX. Urinary Tract—XX. Urine—XXI. Male Genital Tract—XXII. Female Genital Tract.

Next follows a list of contributors, accompanied by an enumeration of the titles of their various papers. These gentlemen, mostly of New York City, are presumably some of the "most intellectual and independent" of the seven hundred whose first steps and subsequent perambulations in the domain of microscopical morphology were directed by the author in his laboratory in New York.

Whilst it is evident that the labors of these twenty coadjutors have been very heavily drafted upon in the preparation of this large book, yet it appears that the individual work of Dr. Heitzmann has been far greater than that of any one of his students. And this is what one would expect, after reading in the preface, that we have here the embodiment "of ten years' intense labor."

Much of what is from the author's own pen is merely the annotated translation of papers which he has published in various places since 1872.

The manner in which the matter of this book has been collected suggests, at a first thought, the great "Manual of Normal Histology," edited by Stricker, or the less pretentious, although really excellent volume of a similar character recently edited by Satterthwaite. But if such a comparison were carefully drawn, it could but result in an unfavorable criticism of the book before us.

Notwithstanding the odious nature of most comparisons, we feel somewhat obliged to draw a parallel as to some points, on account of the radical opinions and singular assertions which are to be found upon almost every page of this book. Moreover, the author, in his preface, appeals from the opinion of European microscopists to the judgment of American investigators.

This publication is the herald of opinions which have, either directly or indirectly, emanated from Dr. Heitzmann himself, for the various contributors to the volumes are his own students, and however much of "intellectual brightness and independence" he

may claim for them, and their acquaintances may accord, it is difficult to gainsay or to escape the imperceptible no less than the manifest influence which an experienced, enthusiastic, plausible, and successful instructor exercises over the judgment as well as over the habits of observation of the inexperienced, especially whilst they are passing through their tutelage.

It was just at this plastic period that, under his own eye, and—so to speak—guided by his own mind, the author received, as we understand, most of the assistance and support of his co-laborers. And yet he apparently, with intense gratification, publishes the announcement that seven hundred of his students have satisfied themselves of the correctness of his assertions.

The readers of these ARCHIVES need not to be told, on the other hand, that the chapters which form Stricker's "Manual of Histology" were from the pens of trained, experienced, and already distinguished men, most of whom were at least his peers in the use of the microscope, and many of them occupied professorial chairs in some of the most renowned seats of learning on the continent of Europe.

It is unnecessary to say one word more in contrasting the solidity of base and strength of construction of these two works.

Dr. Heitzmann, in the opening paragraph of his preface, states that he is "aware that all the facts and conclusions herein laid down will not meet the immediate approval of professional microscopists."

What are the strange assertions and doctrines of which the author and his pupils have become the apostles? It is not possible here to indicate many, for the whole book teems with them.

Perhaps on the whole it may be more satisfactory, both to the author and to the reader, to cite some of them.

In Section III, upon the arrangement of living matter, we begin to perceive the peculiar notions of the author.

He declares that so-called "protoplasm" is only one stage in the development of "living matter." It is not structureless, but the minute granules often visible in it are points of intersection or nodes of a *reticulum.* This solid contractile net of living matter is suspended in a lifeless non-contractile fluid, which is not simple water.

In other words, the contractile living matter in mesh-spaces contains and encloses a non-contractile fluid substance.

In the state of *rest*, as, for instance, when a colorless blood-corpuscle is just dead, any apparent granule may be considered

as a central mass of contractile matter which is in connection with its neighbors by means of extremely narrow filaments leaving wide meshes.

Contraction consists of increase in size of the granules, increase of thickness, and shortening of the connecting filaments, and consequent approaching together of the granules.

Tetanus is a violent contraction of this living matter, with a running together and fusion of the various granules and the disappearance of the reticulum.

Its opposite condition, *extension*, shows a decrease in size of the granules until they almost disappear, whilst there is simultaneous elongation of the connecting filaments and separation of the now scarcely visible granules. Of course, the meshes of the reticulum are in this state extremely wide.

In addition to the foregoing differences in the distribution of living matter, the author mentions the *swollen globule*, a state induced by the influence of a fluid less concentrated than that ordinarily held in the "protoplasm," as, for instance, by the addition of distilled water.

Increase of fluid in the "protoplasm" is accompanied by the *formation of vacuoles*. In the fluid of the vacuole "granules" torn loose may float. They may throw out filaments which may reach the wall of the vacuole. In such case the latter instantly disappears and the former relations of the net-work are re-established.

Embryological research proves that vacuoles are elementary vascular organs containing plasma. The minutest granule of this living matter, whether detached or not, is capable of all the evolutions and possible developments of life.

The three states of living matter above described, viz., rest, contraction, extension, explain not only the movements of a simple "protoplasmic" lump, but also the action of the most highly developed muscles.

The presence of an outer, though very thin, layer of living matter, is necessary to the various forms and movements of living protoplasmic bodies.

In order to explain the formation of a flat, extended layer of living matter at the bounds of the whole protoplasmic body, as well as at those of a hollow nucleus and of every vacuole, the author assumes that a granule may send out offshoots in great numbers, leading to the disappearance of the central mass, and that these offshoots fastened together laterally may produce a con-

tinuous sheet or layer. By the opposition, edge to edge, of many such sheets, an extensive layer can be produced large enough to envelop the whole cell-body. It must also be understood that the living matter is capable of entering any of the described states at any time, so that a flat layer may immediately change into a net-work, and *vice versa.*

The amount of living matter varies greatly within a given bulk of "protoplasm," both in normal and in abnormal conditions. The colorless corpuscles of persons exhibiting signs of scrofulous constitution, contain much less living matter than do those of strong, vigorous subjects.

Motion is relatively little marked in a solid lump of living matter, but becomes the more manifest the more that living lump has split up into a reticulum—that is, the more it has assumed the appearance of "protoplasm."

A fully-developed protoplasmic body is constructed like a sponge, but, at the same time, is enclosed on all sides by the same substance which forms its trabeculæ.

Nor is a complex amœba, an individual with permanent protrusions—the extremities with a wonderfully complicated division of labor of the groups of living matter.

There is no such thing as an isolated individual "cell" in the tissues; the various lumps of living matter are united throughout the organism, thus rendering the whole animal body an individual.

Both in man and in the amœba, isolated lumps of living matter float about; in the former in the blood- and lymph-vessels, in the latter in the vacuoles.

In Section IV, the ideas of the author concerning "development of living matter" are ventilated in his characteristic style.

The condition of the youngest protoplasm is that of a compact mass of living matter, homogeneous, of a yellow tint, considerable lustre, and possessing the property of staining red by a solution of carmine, and violet by a solution of chloride of gold.

In this condition no reticulum is demonstrable, and little, if any, locomotion is possible. This state is similar to that of a tetanic lump of a violently contracted amœba, and the author has named it *hæmatoblastic*, for he asserts that small lumps in this condition are often directly converted into red blood-corpuscles, though they more frequently undergo other metamorphoses.

The first step in the progressive development of hæmatoblastic substance, is the accumulation of liquid in vacuoles. By the ac-

cumulation of liquid in several such closed cavities of the young lump, the living matter assumes the shape of a *frame-work*. A *net-work* of the living matter, representing a later phase in its develoment, is established through an intercommunication of the cavities of the numerous vacuoles by means of the rupture of the partitions of living matter which divide them.

The more yellow and shining and more densely packed the points of intersection of the living reticulum are, the younger is the protoplasm ; on the contrary, the more delicate, devoid of color and lustre the granules are, the more advanced is its age.

The originally homogeneous lump of protoplasm with increase of size becomes transformed, on its peripheric portion, into a net-work, wherever the central portion, *i. e.*, the nucleus, remains homogeneous. Next, a differentiation into a frame-work and subsequently into a net-work involves the nucleus, still leaving untouched the compact nucleolus.

Finally, this differentiation into a net-work pervades the whole protoplasmic body, when no nucleus and still later even no nucleolus is visible ; the entire mass being split up into a reticulum, with coarser and finer points of intersection.

The living matter passes through these stages not only in the normal progressive development of all tissues ; in the process of inflammation it undergoes identical metamorphoses, but now in reversed order.

There is an important peculiarity exhibited at certain phases of life of protoplasm, whether in health or in disease. Young *compact* protoplasm is in a high degree possessed of the property of coalescing with analogous protoplasm, and thus of changing its configuration, and to a certain extent also its relations, whereas it is endowed in slight degree only with active mobility. At this time the power of locomotion is entirely absent.

The power of active motion increases by degrees and grows up to a certain point, with the increase of liquid in the meshes of the reticulum. The "pale and finely granular protoplasm," which consists of a very delicate reticulum, has, therefore, the most marked capacity of locomotion.

The following is an abstract of what is said of the "cell-theory," in the light of the author's researches :

What others have called a structureless, elementary organism, "a cell," Heitzmann sees to consist only in part of living matter, whilst even the minutest particles of this matter are endowed with all the manifestations of life. The nucleus cannot be considered an essential part of the cell.

The difficulties of a definition can only be escaped by abandoning the designation "cell."

The present generation of histologists will very probably never realize the harm done by that misnomer "cell," so firmly established during the last forty years.

An effort is now made to replace this objectionable misnomer with new words and terms. The "cell-doctrine" is entirely abandoned, and the "bioplasson doctrine" of one of his pupils is attempted to be set in its stead.

The word "bioplasson," a technical synonym for "living, formative matter," is substituted for protoplasm. The term "plastid," proposed by Hæckel, is used to designate a so-called "protoplasmic body," or form-element, formerly recognized as "the cell" of authors; whilst the word "bioplast," as proposed by Beale, may be employed to indicate a small mass of living matter exhibiting no differentiation whatever.

This bioplasson is all-pervading. It exists in the bioplasts, and in the plastids which contribute to the constitution of tissues and organs; it is diffused throughout the so-called formed material, or intercellular connective substances, everywhere; it unites and binds together every particle or mass of living matter, by means of a fine reticulum of universal connections, into one single intimate mass of bioplasson, the limits of which are commensurate with those of the animal itself, however minute and simple, or gigantic and complex, its construction may be.

We might go on and multiply almost *ad infinitum*, abstracts of the peculiar notions with which the eight hundred and fifty pages of this book abound, but there is a limit to the space at our command, as there is also a limit to the patience of the reader. The time has therefore come to bring this review to a close.

We have endeavored to fairly indicate the peculiar stand-point from which our author and his pupils study the questions of general histology and pathology.

It remains to point out a few of the *extra-conspicuous*—we might with reason say extra-ridiculous and visionary—claims of Dr. Heitzmann.

In 1877 the author announced that colorless blood-corpuscles exhibit striking differences as to their minute structure, according to the general constitution of the individual in whom they exist. He affirmed that these elements are coarsely granular and slow in their amœboid movements under the microscope, if taken from healthy, vigorous persons; that, on the contrary, they are pale

gray, finely granular, viz.: poorly provided with bioplasson, in broken-down or phthisical individuals. At the same time, the hope was expressed that at some future period practical use might be made of these differences.

To-day, "after three years' earnest study," his hopes are asserted to have turned into accomplished facts.

He claims to have arrived at a point of perfection which allows him to tell with certainty the constitution of a person without knowing any thing of his present or former life, and even without seeing more of him than a few of his colorless blood-corpuscles.

In fact, he declares that the microscope, through the colorless blood-corpuscles, revealed so much of the general health of a person, that more can be told by it in than by many instances the naked eye or by physical examination.

According to him, life insurance should be based upon microscopical examination of the blood, as well as upon percussion and auscultation.

He would have marriage allowed in doubtful cases only upon the permit of a reliable microscopist (! !).

Apropos of this, we venture to quote the author verbatim: "Last session a young physician asked me whether I believed in marriage among kindred. He and his cousin had fallen in love with one another. I examined his blood, and told him that he was a 'nervous' man, passing sleepless nights, and had a moderately good constitution. This condition being suspected in the kindred body, marriage was not advisable, for fear that the offspring might degenerate. So great was his faith in my assertions that he gave up the idea of marrying his cousin." We pause a moment to wonder if this was "one of the most intellectually brilliant and independent" of the seven hundred.

This youth "offered his cousin *the last chance*," viz., the examination of her blood.

"This beautiful girl came to my laboratory, and very much to my surprise, I found, upon examination of her blood, a first-class constitution."

The next day, we are informed, the great augur spoke, and graciously permitted the banns of marriage. It is to be presumed, although it is not stated, that they were ever after happy, and have already become the progenitors of one of the purest strains of blood known in the annals of medicine.

Such opinions, smacking so strongly of "business" and of "the shop," and such an egotistical and injudicious announcement of

them, many will think more proper to be found in the advertising columns of some professional charlatan, than to have a place in a scientific record.

It is most unfortunate for the respectability and great importance of microscopic research that any one, whether in Europe or in America, so skilled in the use of the microscope and so successful as a teacher as is our author, should for any reason whatever be led, in his publications to the world, to step so boldly and incautiously beyond the bounds of common experience and common-sense.

At the beginning of these remarks we had occasion to refer, in terms of respect, to the great name of Stricker, at the head of his great work upon normal histology. We were sorry to learn, in the first chapter of Ashhurst's "Encyclopædia of Surgery," that Stricker, too, now in his old age, has joined in this unseemly scramble between teachers and pupils for leadership in proclaiming nihilism against the "cell-doctrine," and has also come to America, not as how most have come, *in persona propria*, but as a contributor to one of our standard authorities, perhaps hoping to find upon our free soil the necessary conditions of credulity, ignorance, restlessness, and infatuation for a rampant growth of his new doctrine.

We have one word to say to Dr. Heitzmann, to his former master, Prof. Stricker, and to all others who have radical and revolutionary ideas, however justifiable, to communicate, viz.: that there is a proper, as there is an improper, way to publish them in America as well as in Europe; and that it is usually conceded here, as well as there, that books which would aim to be considered standard, are not the most appropriate channels through which to propagate unestablished hypotheses.

The hypotheses which Dr. Heitzmann has chosen to label as facts may be true, or they may be false. We do not now undertake to decide. He himself prefers to settle this question with beginners rather than with accomplished microscopists.

The chief justification for the appearance of a new text-book, namely, *une raison d'être*, cannot, in our opinion, be reasonably claimed for this work.

Its radicalness renders it unfit to be placed in the hands of those who should at first learn facts as they are generally accepted.

As a very full and orderly bulletin of the work done in Dr. Heitzmann's laboratory, as well as of the peculiar theories ema-

nating therefrom, this book possesses a certain interest and value for those who are sufficiently advanced in the study of pathological histology to pass an intelligent judgment upon the claims of the author and his pupils. [E. O. S.]

The International Encyclopædia of Surgery, etc., edited by JOHN ASHHURST, Jr., M.D., etc., in six volumes. Vol. II, New York: William Wood & Co., 1882.

The volume commences with a somewhat insignificant article on *Contusions*, by Hunter McGuire, of Philadelphia. Every thing said, however, is unapproachable. It is difficult to see how an interesting paper could be gotten out of such a meagre subject, that might have fitly formed part of one or another of the articles contained in the volume.

Mr. Bryant, of London, contributes an article on *Wounds*, in many ways worthy of interest, and affording a remarkable instance, in dilute form, of the "animus medicorum." After having read through carefully this and the subsequent paper, by W. Watson Cheyne, on *The Antiseptic Method of Treating Wounds*, it is difficult to the unbiassed mind to find any essential points of difference in the principles advocated, the divergence being simply that of using either oil of terebene or a watery solution of carbolic acid.

The necessity of cleanliness in every detail, of rest and drainage, is insisted on by both writers in strangely similar terms; yet to the astonishment of one not acquainted with the undercurrents of English medical life, differences are pointed out carefully and explicitly, which cannot fail but appear trivial and unworthy of prominent notice in the discussion of such an important question as the treatment of wounds is. Happily, the animosity tinging and muddling almost every discussion of this subject in former years, is giving way to a more courteous spirit, and invective and ridicule are only used by some tacticians of the veriest rear, whose utterances are listened to chiefly out of respect due to age, and for the fun they contain. But the abstract principles of the antiseptic treatment of wounds have victoriously carried every obstacle, and therefore it is painful to still see a wrangle going on about whether this or that be the true antiseptic substance. We know that the greater the personal cleanliness, talent, skill, and vigilance of the individual surgeon, the less he needs the aid of antiseptic substances; but this exceptional talent for surgical cleanliness being very rare indeed, the average phy-

sician ought to be glad to accept the powerful aid of antiseptics in warding off or excluding putrefactive influences from accidental or operative wounds. We have come so far as to see everybody admit, in the abstract, the necessity of the first essential in wound-treatment, that is, *cleanliness;* but what a variety of gradations and what a multitude of individual conceptions does this idea embrace as carried out in the concrete by the several practitioners? What seems a fair degree of cleanliness to one may be found often a slough of filth to another; but the necessity of well-cleansed nails and of frequent ablutions, enforced by personal scrutiny, would still produce bitter resentment in many followers and opponents of Lister. And yet the success of a grave operation depends on just such trifles. The smaller the wound, the more rapid and skilful the surgeon's hand, the more confirmed and, so to say, automatic the operator's and assistants' habit of surgical cleanliness, the less the need for chemical antiseptics.

It is forgotten too often that surgery is an ART "*par excellence*," and that practical success involves not only much knowledge and frequent practice, but besides, individual talent and skill, the versatility, prudence, courage, and quickness of a consummate hunter, or, let us say, even of the strategist. It is not the kind of gunpowder alone that wins battles, but the wisdom, energy, and skill of the general. So it is with terebene and carbolic acid. A Lawson Tait and a Keith succeed marvellously without one drop of carbolic acid, because they are masters of their art; the rank and file of the profession, however, not possessing such exquisite talents and skill, must rely on the aid of one or another antiseptic agent, which will help to eliminate the dangers of accidental contamination due to lack of personal dexterity, and, most of all, in the case of the general practitioner, want of frequent opportunities to exercise the difficult and nice manœuvres of this art of arts.

Mr. Bryant's treatment of his subject shows throughout the hand of the experienced modern surgeon, and a careful study of his remarks on the first management, second and subsequent dressings of wounds, will well repay the trouble. A concise and very objective criticism of the older methods of wound-dressing is an acceptable feature of the article,—Guérin's cotton-dressing, the open treatment, that by irrigation, simple water, and dry earth and alcohol dressings; finally, pneumatic aspiration and occlusion, all receive due attention. Neuber's peat or mould dressing might have been mentioned in connection with Addinell Hewson's earth-dressing method.

At the end of a long tirade directed against the germ-theory and its advocates, *subcutaneous wounds* occupy the author's attention. And here an inherent contradiction will be found lurking in Mr. Bryant's efforts to explain the curious facts relating to subcutaneous wounds. Malgaigne's old inconclusive test to prove the innocuousness of unfiltered atmospheric air, namely, rendering animals emphysematous by pumping air into their tissues, then fracturing subcutaneously their bones, dividing their tendons, etc., without producing suppuration, is brought forward as a final overwhelming argument, showing the futility of the germ-theory. In the next sentence, however, we find the author "disposed to think that it is not the mere exposure of a wounded part to the influence of air that does the harm, but its *prolonged exposure.*"

It is difficult to understand that someting originally so innocuous as air is, according to Mr. Bryant, should mysteriously become more and more deleterious or poisonous as it remains in prolonged contact with an open wound. It is not the chemical components, it is not germs or dust particles that do the mischief, it is *prolonged exposure to something utterly innocuous.* This certainly surpasses ordinary powers of conception. The contradiction between the author's shaky theory and sound practice is obvious. Every physician attempting the treatment of accidental or operative wounds should constantly bear in mind Mr. Bryant's excellent remark : "It is well, however, for the student to recognize the fact that most of these causes (disturbing normal repair) are preventable, and that they are, as a rule, *due to some want of care in the primary dressing of the wound.*"

Mr. Watson Cheyne's short paper contains most that can be said regarding the technique of Lister's dressings. A noticeable feature is the absence of that dogmatism that formed one of the most objectionable features of some of the earlier writings of Lister's adherents.

The successful substitution for carbolic acid, of thymol, eucalyptol, iodoform, iodine water, sublimate and subnitrate of bismuth have convinced even Mr. Lister that "all roads lead to Rome."

Dr. John H. Packard, of Philadelphia, renders a terse but good account of *Poisoned Wounds.* Dissection-wounds receive an adequate amount of attention, and, on the whole, their classification is very good. The author broadly distinguishes cadaveric from insect and snake poison, insomuch as the latter two are said

to act mainly by their immediate chemical, the former by its ferment-like, properties. Recent researches regarding *sepsine* and *ptomaïne* and their purely chemical action are not mentioned, and the fact of the occurrence of insignificant dissecting-wounds, accompanied by hardly any local irritation, but by fearfully rapid and effective systemic poisoning, is also omitted.

The writer of these lines deplores the loss of a young friend that took place about twenty-four hours after the infliction of a small puncture of a finger at an autopsy. The absence of local inflammation of the scratch and of the axillary lymphatic glands was remarkable, and death ensued by septicæmia similar to that produced by snake-bite. Only two of the many preventives used immediately after the infliction of a dissecting-wound are mentioned: one, the nitrate of silver, rather unreliable; the other, a white-hot needle, too heroic. Acetic acid has been found in a large number of laboratories abroad and at home to be very effective and agreeable. Insect-stings are well considered, likewise snake-bites and their treatment. No mention is made of bites caused by *man* and *the horse.*

The most important part of Dr. J. H. Bill's paper is that relating to *Arrow-wounds*, which will interest every surgeon; first, because of the intrinsic curiosity of this ancient form of shot-wound, but also on account of the thorough and original manner of the author, attesting both literary and practical knowledge of his exotic subject. What may be aptly termed the natural history of arrow-wounds, especially of those made by the North American Indian, is followed by a full consideration of their treatment. In view of the achievements of antiseptic surgery, the therapeutical principles laid down by Dr. Bill will need some modification. The rigid rule "that an arrow-head left behind and lodged in the tissues must be removed as soon as possible, even if this removal should require the severest and most dangerous of operations," will undoubtedly admit of important exceptions, and it is difficult not to find opinions exaggerated that are clothed in the following words: "We might as well cut the patient's limb up until we do find the arrow-head; for if it is left, *amputation will be necessary* (?),[1] and worse than this can hardly ensue from the dissection advised. If I should undertake such an operation, I would make up my mind to find the arrow-head, even if it became necessary to tear up every fasciculus of every muscle in the injured member." If

[1] Reviewer's italics and sign of interrogation.

penetrating gunshot wounds of the chest and abdomen, and gunshot fractures of joints heal kindly without an extraction of the projectile having been practised, an attempt of such a course would undoubtedly commend itself in the case of many arrow-wounds also.

The advice to complete the division of a nerve cut through partially by an arrow, may be perfectly sound as applied to some cutaneous branch ; but to maintain this to be "the correct treatment even if a nerve as large as the sciatic were partly divided," is carrying generalization too far.

The plan of enlarging abdominal wounds if a lesion of intestine be incontestable, followed by thorough cleansing, enteroraphy, and closure of the incision, is entirely rational and deserving of a trial.

The author's reasons why the cleansing water in abdominal wounds should contain "a little salt and egg serum" are not given. Likewise, an explanation of the following dicta would throw a welcome light on them :

"If any outward application (to the belly) is to be made, I should prefer moist heat, applied by means of large bran poultices. But it must be remembered that, unless frequently renewed, and *kept very hot, they will do harm.*" [1]

It is fair to remark that many practitioners are in the habit of treating abdominal wounds, and cases of peritonitis from whatever cause, with ice-bags applied to the abdomen, and that their success compares favorably with any other form of local therapy. The dangers of a lukewarm poultice must be imaginary indeed.

It was a great loss to military surgery that fate did not permit Otis to fulfil his promise to furnish this encyclopædia with a treatise on *Gunshot Wounds.*

Professor P. S. Conner, of Cincinnati, rendered Otis' task in a very creditable manner. Such of the general considerations as should form the introduction to an essay on gunshot wounds, are carefully yet concisely disposed of, the pathology being materially aided by a number of wood-cuts taken chiefly from Otis. The author, as far as his literary information is concerned, is abreast of the newest achievements of antiseptic surgery as applied to gunshot wounds, but hesitating and guarded remarks recur now and then, showing that his belief has not gone through the fire of actual test. We find, for instance, the sentence : "Of the value of

[1] Reviewer's italics.

the antiseptic method in gunshot head-wounds of all kinds, it is impossible as yet to express any positive opinion"; and again: "Future experience must determine the value of the antiseptic dressing," and so on in nearly every important chapter on therapy. All this A. D. 1882!

Aside from the internal vacillation of the author's views on the therapy of gunshot wounds, the article is very readable, and for the space occupied quite complete.

Dr. T. G. Morton, of Philadelphia, furnishes a well-written paper on *The Effects of Heat.* Under the head of *prophylaxis of burns*, external means of escape from buildings, and the fire marshal, are discussed, which, it seems, is stretching the meaning of prophylaxis to an unnatural extent. Likewise it is questionable whether the effects of caustic, chemical substances can properly be merged into the same category with burns and scalds.

The action of heat on organic substances is very uniform so far as the chemical processes accompanying it are concerned; but it is known that the corrosions produced by certain chemicals, for instance by fluoric acid, are quite peculiar in their nature and clinical aspects, and deserve of special mention.

The relations of albuminuria to the processes subsequent to severe burns are carefully considered, the author's personal observations of an exact character serving as a fit basis therefor. The treatment, local and general, forms one of the most valuable chapters of the essay. We miss the mention of the methodical treatment of cicatrizing granulating wounds by orthopædic measures, such as passive motion with stretching of the granulating surfaces and confinement during intervals in suitable appliances, as warmly advocated by Koenig of Göttingen, A. C. Post of New York, and many others.

The article on *The Effects of Cold*, by Dr. J. A. Grant, of Ottawa, will disappoint the reader in many ways. Its best side is its shortness. The facts and opinions presented do not rise above the level of a layman's knowledge of the subject. The busy practitioner, in search of condensed scientific information regarding the natural history of frost-bite, will, for instance, look in vain for an exact statement of the temperature to which the human tissues can be cooled off with impunity. He will find no explanation of the causes of gangrene after freezing. No description is given of the mechanism determining partial or total necrosis of a member. The therapeutic plans as laid down by the author are too scanty, and will not satisfy the wants of the modern practitioner. Why

sudden warming of frost-bitten parts is dangerous is not explained. Vertical suspension of the extremities, as warmly recommended by Bergmann, whose Russian experiences claim due respect, is quite ignored. The pages bear the marks of hasty compilation.

Mr. Howard Marsh, of London, has well succeeded in presenting attractively the important subject of *Abscesses*. The few things that have to be said about the matter are well arranged and shortly but clearly stated, and will engage the interest of the reader.

An article from the pen of the late Dr. John T. Hodgen, of St. Louis, on *Ulcers*, is full of practical information. It is bare of all scientific pretensions, and confines itself strictly to the discussion, in a thorough and original manner, of the clinical aspects and treatment of ulcerations, chiefly of those of the leg.

"*Difficile est satiram non scribere*" might be aptly written below the title of the next paper, a disquisition on *Gangrene and Gangrenous Diseases*, by Dr. E. M. Moore, of Buffalo. In reading through the succession of pathological and surgical crudities, first curiosity, then amused astonishment, finally indignation, will be felt by the reader at the time thus lost. The entire absence of a systematic arrangement of the subject-matter is equalled by the unique literary style and phraseology. Exudate is "*extruded*[1] into the tissue around the carbuncle"; then it is said that "the exudate, which during *its progress* has been incapable of organization, begins to cut *off the dead from the living* by filling the areolar spaces and establishing a line of *circumvallation*. It has been said that there is no essential difference between ulceration and gangrene, the former being merely a cell-death so slowly carried on that the tissue becomes converted into fluid, and is thus washed away with the exudate from the blood which now appears upon the surface. As a result of the retention of the exudate commencing a process of organization, we have a heightened capillary circulation, and the color changes from the dark hue to a paler one, and then to a red, the last being the condition which clearly marks the arrest of gangrene. This red line, *looked forward to* by the surgeon, is of course produced *by the return of the true circulation*." Incisions "allow an opportunity for the exudates to escape." Peritonitis sometimes ends in "gangrene of the bone."

[1] All our italics.

In quoting a few more similar passages the best criticism will be given.

About amputation for gangrene we read : " The experience of surgeons, then, has declared itself in favor of the practice of waiting until Nature has thoroughly arrested the progress of the disease. *Neither are they in haste to make the knife follow her declaration of the arrest, until the abundant exudate becomes in itself a depressing condition.*" In discussing hospital grangrene, the learned author says : " Many surgeons in the employment of escharotics have failed to find the benefit which they have produced in the hands of others." " In senile gangrene " the patient " is dying at the extremity."

What senile, hospital, and white gangrene are, the reader is left to find out by himself as well as he can. American surgeons will hardly feel complimented by the editor's publishing Prof. Moore's effort as a fair sample of American surgical writing and erudition.

The subject of *Venereal Diseases* occupies about one third of the space of the volume, but also represents the most solid and valuable portion of the same. Of its four subdivisions, Dr. J. William White, of Philadelphia, undertook the treatment of *Gonorrhœa*, and, it is fair to say, delivered himself of the task in a thoroughly satisfactory manner. The essay is replete of just the information sought after by the practitioner ; yet, with all care bestowed on the practical side of the subject, theoretical considerations are everywhere pointed out as the true basis of scientific practice. The systematic arrangement of the material is excellent, and adds considerably to the interest held alive by the author's lucid style. The author believes gonorrhœa to be in nowise specifically different from other forms of catarrh, and considering the nature of the evidence adduced by the opponents of this view, his position must be considered as unshaken.

The pyæmic nature of gonorrhœal rheumatism is all but accepted ; strangely, the metastatic theory is declared to be untenable, and the only prop of this view is the following sentence : " If the disease were due to metastasis, *the original affection should disappear.*"[1] The author could not have thought of pyæmic metastases when he wrote the above sentence.

As far as the matter is concerned, the division of the *chronic urethral discharges* is thoroughly rational, since it is based on the

[1] Our Italics.

morbid changes of the organs affected, namely: (1) on a simple catarrhal inflammation; (2) on a granular or superficially ulcerated mucous membrane; and (3) on urethral coarctations, known as strictures of large calibre. But the author, instead of naming these three conditions from their underlying anatomical causes, rather adopts an arbitrary and in itself meaningless nomenclature, inasmuch as he calls the state of granular urethritis "chronic gonorrhœa," and that of incipient stricture, "gleet." Both "gonorrhœa" and "gleet" are mere symptoms, denoting the *discharge* created by this or that pathological condition of the urethra. The paragraph relating to stricture of large calibre is very satisfactory, and free from the excesses of the school of F. Otis. The mechanism of the development of these strictures is gone into extensively. Therefore, it seems strange that the author should have entirely omitted the mention of the most important factor in producing dribbling at the end of micturition, namely, over-distension of the urethra back of the stricture. The diagnostic and therapeutical tenets are throughout clear, complete, and rational, and Dr. White is careful to mention in numerous foot-notes all of the more important curative plans, as advocated by other authors.

While he observes the most liberal and philosophical attitude just where other writers in this field are apt to become biassed by therapeutic preferences and prejudices, namely, in recommending this or that formula to cure a clap with, we see him fall into this very fault regarding a state of which his experience must necessarily be much more limited than of the diseases of the urethra. Herein we see another illustration of the old experience, that the better we know a complicated thing, the more careful and guarded will be the expression of our opinions regarding it. The author is careful and circumspect in his dicta about the therapy of urethritis, which he knows so well; but in gonorrhœal arthritis, the true nature of which to him and the rest of his confrères is *terra incognita*, or nearly so, he is reckless and bold in recommending his "therapeutic measures far superior to those following any other plan of treatment."

We are much inclined to attribute the greatest importance among Dr. White's measures to immobilization of the affected joint, with the rational use of anodynes during the first, most acute stage of the complaint. And it may be permitted here to state, that since the time-honored, purely medicinal treatment of these cases of arthritis is being more and more combined with

local, that is, surgical measures, such as immobilization in the beginning, later on cold douches, massage, and gymnastics, the results are far superior to those attained by another generation of practitioners,—who trusted too much in alkalies and salicylic acid, iodide of potassium, colchicum, and the host of other remedies that have been used in the treatment of rheumatism.[1] In disregarding the surgical aspects of the affection, they permitted the undue development of secondary, notoriously rebellious conditions, the main cause of the ill repute of this disease.

The expression "inordinate masturbation" occurring under the head of "gonorrhœa in the female" is apt to provoke the question: "Is there an orderly form of masturbation?"

A number of well-executed chromo-lithographic plates and wood-cuts serve to enhance the value of the article.

Dr. F. R. Sturgis' essay on *The Simple Venereal Ulcer, or Chancroid* is a worthy companion of the preceding paper, both as to form and intrinsic value of its contents. Instead of pronouncing a definite view, the author wisely confines himself to an historical synopsis of the development of the conception of the venereal ulcer, carefully stating all the important aspects of this still unsettled question. Dr. Sturgis is, as becomes the nature of the subject, careful to stick closely to well-known facts, always giving his authority as he proceeds. Every page bears the mark of well-matured knowledge and a thorough mastery of the matter at hand.

Dr. Sturgis is an energetic advocate of thorough-going applications of the actual cautery to spreading simple and to phagedænic sores, likewise to suppurating buboes of virulent character. Exception must be taken, from surgical considerations, to the use of the *white*-hot iron under all circumstances, even when used as a hæmostatic. It will prove to be the opposite of a hæmostatic. Among the chemical caustics enumerated, the chloride of zinc will be missed.

Very good chromo-lithographs accompany the article.

The third essay on venereal diseases comprises the difficult subject of *Syphilis*, and Dr. Arthur Van Harlingen, of Philadelphia, has succeeded in stamping it with the character and dignity of a monograph. Throughout, every important statement is borne out by careful references—a most commendable feature of scientific literary work.

[1] See Wm. H. Draper in Detroit *Lancet*, Feb., 1881.

The author gives at the outset his unqualified adhesion to the dualistic school of syphilographers. Under the subdivision of *general pathology*, the sources of syphilitic infection are critically reviewed, and the author adopts the rational classification of the symptoms of the disease into those of the *initial* and those of the *general* period. The common and unusual sites of the initial lesion are next considered ; finally, the differential diagnosis receives adequate treatment. The portions devoted to the period of generalization are excellent. The initial fever, and the disturbances of the different organs observed at this stage, are next disposed of, to be followed by a very clear statement of the now almost generally accepted system of classification of syphiloderm. Each organ receives due attention, and the author's practice of giving under each heading the local therapy necessitated by the peculiarities of the several regions and organs, is very commendable and of great practical utility. After a good exposition of hereditary syphilis, the *general treatment* of the disease engages the reader's attention.

The author's advice of not commencing mercurial treatment before an unmistakable manifestation of general symptoms has taken place, and his reasons therefor, will commend themselves to everybody familiar with the subject. On the other hand, he urges the employment by all means of a general tonic treatment during the initial period, so as to fortify the patient against the things to come.

The therapeutic principles laid down regarding the internal and external administration of the different preparations of mercury are unexceptionally sound, and have stood the test of general experience. The statement that hypodermic injection of mercurial solutions has not gained extended favor on this side of the water is true, but the reason of this may be sought for in Dr. Van Harlingen's confession that, "in spite of every precaution, abscesses will occasionally form at the point of insertion of the needle." The writer's experience tends to convince him that abscesses are always due to uncleanly and careless management of the solutions and instruments employed ; that a proportionately great number of patients will gladly submit to the pain caused by the injections in exchange for a cleanly, exact, and very effective mode of treatment, and that the main and unfounded prejudice against this plan lies chiefly with the members of the profession.

The hints given about facilitating the administration of the iodide of potassium are excellent. The indiscriminate employ-

ment of the "mixed treatment" is justly condemned. The article concludes with a concise consideration of the relations of syphilis to marriage. A large number of chromo-lithographs illustrate the different pathological conditions.

The cycle of essays on venereal diseases is concluded by a short, somewhat meagre, article, on *Bubon d' Emblée*, *Venereal Warts or Vegetations*, *Pseudo-Venereal Affections*, *Venereal Diseases in the Lower Animals*, by Dr. H. R. Wharton, of Philadelphia.

Professor James C. White, of Harvard, contributes an unpretentious yet withal valuable paper on the *Surgical Diseases of the Skin and its Appendages.* The synoptical arrangement lacks the characteristics of a systematic treatise, and the reader will not find any space devoted to general pathological or therapeutic considerations. This enumerative form of presentation possesses many advantages of a dictionary, but also has its drawbacks. The general practitioner, however, will very likely find both matter and form thoroughly practical, and therefore highly convenient. Every thing said in this article is characterized by clearness of statement and practical common-sense.

The great importance of the subject of connective-tissue inflammation can hardly serve as an excuse for presenting its different aspects and forms in three distinct articles by three different authors. First we had Van Buren, then we heard Mr. Marsh, and now again Professor Joseph W. Howe, of New York, attacks the matter under the title *Diseases of the Cellular Tissue.* The author must have felt that a simple regional enumeration of abscesses hardly deserved the distinction of a separate article; at least, the introductory remarks seem to contain a veiled apology for its presence. Mr. Marsh could have easily and appropriately disposed of this additional matter in his article on abscess.

The classification of the different forms of cellulitis according to their anatomical relations is unsystematic and incomplete: unsystematic, because we find peri-venous and peri-arthritic cellulitis ranged alongside of ischio-rectal, peri-urethral, peri-phalangeal, peri-cæcal, and orbital cellulitis; and incomplete, because these forms are the only ones selected to the exclusion of all others. The plea that they are the most important ones cannot stand, since we know that, for instance, there is a retro-pharyngeal, a submaxillary, a mediastinal, a submammary, and many another important form of cellulitis, not excluded by the limits

imposed on the author by the editor. Turning to the individual chapters of the article, we find early incisions recommended in peri-venous cellulitis, but no specification of the manifold anatomical localities, and the exact methods of opening these several foci, each requiring the observance of certain important cautelæ. The incision necessary in a subcutaneous phlebitis of the leg, for instance, would be quite a different affair from opening a periphlebitic abscess of the deep jugular.

In connection with peri-arthritic cellulitis no distinction is made between acute and chronic or secondary abscesses, and their different treatment.

It is an unfortunate fact that the nature of the limits imposed on the author by the editor robs him of some of his best opportunities ; but, on the other hand, Professor Howe might have done better, even thus handicapped, if he had tried.

The volume closes with a valuable and rather complete synopsis of the *Injuries and Diseases of Bursæ*, by Dr. Charles B. Nancrede, of Philadelphia, the special part of which will be full of interest to those requiring enlightenment in this branch of surgical knowledge. The work will be all the more appreciated, as the space devoted to its subject in most hand-books is altogether inadequate.

[A. G. G.]

ORIGINAL OBSERVATIONS.

A CASE OF LARGE PROSTATIC ABSCESS.

By CHARLES H. KNIGHT, M.D.

The following case of prostatic abscess, which I was invited by Dr. Asch to see in consultation, is somewhat unusual, as regards both its cause and its rapidity of development.

The patient was a gentleman of forty-five years, who gave a history of syphilis, contracted some twenty years ago, and of one attack of gonorrhœa about ten years ago.

He had been troubled with dysuria for several days, and had himself attempted to introduce a catheter. With a view of discovering the cause of the difficulty, a No. 26 Fr. flexible bulb, the largest the meatus would admit, was passed into his bladder without demonstrating the existence of a stricture or of any specially sensitive point in the urethra, although the bulb of the instrument brought out a small quantity of bloody pus. Six or eight hours later he had a severe chill; urination became more difficult, and was attended by vesical tenesmus. Examination of the rectum, at this time, revealed nothing except extreme heat. The bladder was emptied with a small flexible catheter, its introduction being attended by very little pain and only slight difficulty. The following morning the temperature was found to be 107°; the patient was extremely nervous and restless, and had had several slight chills during the night. There was almost constant desire to void urine, which could be passed only drop by drop, and the bladder again required emptying with the Nélaton catheter. There was still great heat in the rectum, but the prostate was not especially sensitive, and no pain at all was experienced on very firm pressure in the perineum. The fever gradually diminished under the free use of quinine. Late in the afternoon of the same day,

while in the act of rising from bed, the patient was startled by a profuse discharge of pus from his urethra, the quantity of which he estimated at *four ounces.* In the course of several minutes, on attempting to urinate, a sharp cutting sensation was felt along the urethra, and a small calculus made its appearance at the meatus, followed by a copious flow of urine.

Within a half hour of this occurrence there was complete subsidence of vesical tenesmus and of febrile excitement, and no further unpleasant symptoms were presented.

The concretion, which had, no doubt, been the cause of the acute prostatitis, was of the size of a small pea, and consisted of an irregular nucleus of inspissated mucus, encrusted with a rough layer of phosphates.

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ARCHIVES OF MEDICINE.

Original Articles.

RELIEF OF STRANGULATED HERNIA.

By JOHN VAN DUYN, M.D.,
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THE following record of five cases of strangulated hernia, which, for their relief, were subjected to operation, were the last successively in our experience. From this record all facts have been excluded, except those which were necessary to give prominence to their special features. These cases are here offered, because they illustrate a doctrine which, though taught in the writings of the day, is still largely neglected by the profession. That doctrine is: when a hernia has become strangulated, its relief should be by operation; and when preceded by taxis, that taxis should be by single effort, and made only on strictly mechanical principles, without force. In this is implied, that a taxis characterized by the exercise of force alone—brute force—is useless and pernicious, but that a taxis which is conducted with mechanical skill and dexterity, which recognizes at once the obstacle and the force to overcome it, and the expediency of the effort, is the only safe and availing one. The former, rarely successful, will surely greatly enhance the danger of sphacelation of the hernial contents, but the latter has but little influence to prejudice nutrition of the gut, and its effects, therefore, cannot hazard the future recovery.

The practice of frequent and forcible taxis has its exemplification in every public case of strangulated hernia. By public cases, I mean those around which the doctors flock as with common right, as in the case of physicians, or of those who fall out of procession, etc. The latter of these finally find their way into hospital. The common practice here is for every man to try his hand and his weight, and when success has not crowned his efforts, or when the hernia has been reduced *en masse*, then the sufferer falls into the hands of him who operates, and who soon adds another to his list of fatal cases. On the contrary, the proper taxis is gentle and full of manœuvre, yet with method, and calls into highest exercise a tact which, we fear, is a gift and rarely to be acquired.

As a witness to the treatment of a large number of cases of strangulated hernia, we are convinced that but few of the public cases recover. In fact, we have known but one such case to survive treatment, and that case recovered with an artificial anus. These cases show that the fatality after operation for the relief of strangulated hernia is in direct ratio to the efforts at taxis. On the other hand, cases under a single management have widely different care. They are subject to taxis in accordance with the views and practice of the surgeon and his assistants. Then, in the event of failure, the operation for the relief of the strangulation is performed. This class of cases teaches the converse of the former proposition : that success in hernial operations is as the infrequency of taxis and the absence of force. The conclusion, in other words, is, that the less taxis the greater success.

If it were not for the fact that a percentage of cases of strangulated hernia yield to a right taxis, this refuge of irresolution would be entirely taken away, and we are forced by observation and statistics to believe that it were far bet-

ter if taxis had never been taught. The operation by which so many lives have been saved has, when properly performed, never been responsible for a fatal result. The operation is innocent. The wound is comparatively insignificant, and although the peritoneum is thereby wounded, yet this is no important factor in the result. Abdominal surgery, in all its phases, teaches the disregard of the wound of the peritoneum, and demonstrates its innocuousness. It asserts its non-responsibility for peritoneal inflammation; on the contrary, it presents the section of the peritoneum as a means in the treatment of certain inflammations of the peritoneal cavity. The operation for strangulated hernia, in itself, is free from danger, and should be employed at once and, in most cases, in place of taxis.

Case 1.—A., salt-packer, forty years old, had a right inguinal hernia, which had existed twenty years. One day, while at work and making unusual efforts at lifting, the hernia became strangulated. At the same time, he felt too weak to continue at work, and suffered from severe pain in the region of the hernia and in the abdomen. He went home and went to bed, and applied hot salt-bags to the tumor, and from the tenderness could not make the pressure he had been in the habit of making in order to replace the gut. He sought no relief until the fourth day after, when we were called. We found the same conditions which had existed from the first. There had been no vomiting or nausea. From the time elapsed, and the tense and tender state of the hernial tumor, operation was at once decided on, and, under anæsthesia, it was performed. The loop of intestines was very black and adherent to the sac, due doubtless to the inflammation subsequent to strangulation, because up to that time reduction had been perfectly easy. Recovery proceeded without complication, and at the end of two weeks the wound had healed throughout.

Case 2.—Mrs. B., aged fifty-two years, had been afflicted with left femoral hernia for twenty-one years. This remained reducible until ten years ago. Then there appeared a tumor which became permanent and gradually increased in size, although subjected to severe external treatment, by pressure and various stimulant applications. This tumor was omental. One morning, while at her

bath, the hernial tumor suddenly enlarged, and she experienced, as she expressed it, "a sickening, indescribable feeling." She went to bed, and, having been aware of the danger of strangulated hernia, she became greatly alarmed and sent at once for help. This occurred at 7 A.M., and within the hour following we arrived at her side and administered chloroform to full anæsthesia, but failed in the taxis. The operation in case of failure by taxis, by agreement, was deferred until 1 P.M., six hours after strangulation, when, with the assistance of Dr. Didama, the usual operation was performed. On opening the sac, it was found filled by a large adherent mass of omentum, and behind this, about eight inches of the gut. The contents were tightly constricted at the upper end of the canal. After division of the stricture, the gut was easily returned. The omentum was dissected from the sac, ligated with carbolized silk, and amputated, and the stump was returned into the abdominal cavity. The wound healed for the most part at once, but did not wholly cicatrize until three weeks had elapsed. A truss was applied shortly after, and Mrs. B. was regarded as cured. Two months later a swelling appeared in the abdominal wall above the wound, which grew in size and assumed all the characters of abscess. Shortly after, another swelling appeared midway between the posterior third of the crest of the ilium and the rib-line, in the abdominal wall. This latter swelling, on the tenth day after its first appearance, gave evidence of fluctuation, was incised, and discharged a large amount of pus, and healed a few weeks later. The former also soon followed the same course, and its contents were evacuated ; but its wound soon closed, and the swelling later reappeared in the sight of the wound of operation. It was then opened and continued to discharge for six months. Recovery then became complete and has remained so. We assume these abscesses were due to the return of the omental stump into the abdominal cavity ; but, although carefully sought for, the ligature was not found in the discharge from the abscesses.

CASE 3.—Mrs. H., Chittenango, aged forty years ; afflicted with a right femoral hernia, caused during an act of vomiting one year before. In the evening of the 8th of last November, this hernia became strangulated, and Mrs. H. made the usual effort to reduce it, but without avail. Nausea soon supervened, and pain, which soon extended from the site of the tumor over the whole abdomen. The next day, the 9th, Dr. Eaton, the physician of the family, was called, who tried the gentlest taxis, but to no purpose.

We went to the doctor's asistance in the afternoon of the same day, and found the patient, twenty hours after strangulation, with an anxious expression, the abdomen tympanitic, with frequent nausea and vomiting, and in great pain. At once ether was administered to full anæsthesia, and the operation was performed. We made no attempt at taxis previous to the operation. The constriction was close, and the color and feel of the gut showed the most imminent danger. After the return of the gut, a large amount of yellowish serum escaped from the now open wound. The wound of operation was healed by the fourth day, and the woman insisted on being allowed to get out of bed. She made too free use of her liberty, and the wound became red and somewhat painful. She was remanded to absolute rest. The wound reopened, discharged a small quantity of pus, quickly closed again, and on the tenth day Mrs. H. was called well.

CASE 4.—Miss G., aged fifty-one, had a right oblique inguinal hernia of six years' duration. During the night of February 15th, while carrying a heavy child, strangulation occurred. She vomited, and experienced hardly more than an uncomfortable sensation at the tumor. The tumor was very small, but refused reduction by the usual method the patient had employed. For two days Miss G. went out, but at long intervals vomited, and suffered slight but increased pain in the abdomen. On the third day we were called and found the condition as given above, and proposed operation, but it was refused. On the sixth day we were sent for again, and found the *status quo* about the same, except with increased tenderness near the tumor. We insisted on an operation, which was granted. Without resorting to the taxis after anæsthesia, the operation was at once proceeded with. The protrusion consisted of a small knuckle of intestine, very closely constricted—so closely that taxis could not have availed for reduction. The sac was filled besides by coagulated lymph. On the fifth day after operation the wound was entirely healed, and, two days after, the patient was allowed to get out of bed.

CASE 5.—F. H., aged thirty-one, a carriage-maker, while shovelling snow, began to suffer pain in the region of an old hernia. He was aware of the cause of his distress, went to bed, and unsuccessfully made his customary attempt at reduction. The family physician was called during the day, who made two efforts at taxis, without success, aided by a position, ice, and opiates. At seven o'clock the following morning we were called. The tumor was then large, tense, and painful. The abdomen was tender, and

there were occasional nausea and vomiting. A diagnosis of omental and intestinal protrusion was made. From these circumstances the operation was decided on and undertaken at once. Under full anæsthesia, and without further attempt at taxis, the tumor was opened. The sac was found to include omentum only, closely constricted at the external ring. After division of the constriction, the omentum was returned to the abdomen. At the end of a week healing was complete. On the eleventh day Mr. H. was well.

In these cases the operation performed was that commonly taught. From the beginning of the section until the final dressing, not the least interference on the part of the assistants, by way of examination of the sac or its contents, by feeling of the constriction, or by digital examination of the opening in the abdominal cavity, was allowed. We thus anticipated the possibility of communicating infection by the fingers of those who, by the circumstance of their business, are most likely to communicate infection. The spray was not used. But, for cleansing purposes, a solution of carbolic acid (1:20) was used, in which the fingers of the operator, the instruments, and the sponges, always new, were previously washed. After the final closure of the wound with silver wire, a pad, dampened in the carbolic solution, was bound over it with moderate firmness.

The only efforts at reduction in case 1 were made by the patient. These were feeble, and the cause of so great suffering, that after a short time they were abandoned entirely. In case 5, the contents of the sac were omental, and, of course, the effect of the taxis was negative.

In two of the remaining cases, only gentle efforts at reduction had been made before the operation. In case 4, no effort was made at all, because of the patient's refusal, until the sixth day, to allow an operation under any circumstances. The time to which the final relief was delayed, and the condition of the sac contents, make it fully certain that

any considerable effort at taxis would have been fatal to the strangulated gut.

The efforts made by the patients themselves need rarely enter into the argument, from the fact that, in the painful condition of the tumor and the increase of suffering caused by pressure, the attempt in most cases is interrupted, short, and free from excessive force.

In case 1, four days had elapsed between the time of strangulation and the operation; in case 2, six hours; in case 3, twenty-two hours; in case 4, six days; in case 5, twenty-three hours.

Healing of the wound was complete in case 1, at the end of two weeks; in case 2, after the end of three weeks; in case 3, on the fourth day; in case 4, on the fifth day; in case 5, at the end of one week.

We are aware that no law can be based on such limited observation. But we believe that the teaching of the record is in the direction of operation without previous taxis.

SYPHILIS AND ANEURISM.

By CHAS. H. KNIGHT, M. D.,

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PECULIAR changes in the cerebral arteries, minutely described by Heubner and others, are usually recognized as syphilitic. These lesions consist, briefly, of a cellular deposit in the tunica intima, beneath the endothelium, producing thickening of the wall of the vessel, diminution of its calibre, and, in some instances, thrombosis. Wilks and Moxon (" Path. Anat.," p. 147), in their description of syphilitic arteritis, refer to a gummous inflammation of cranial arteries indicated by "circumscribed yellowish thickening," affecting chiefly the outer coats. Many observers, while admitting that the lesion of the outer coats is gummatous, deny a specific character to that of the intima.

There are noticeable points of difference between syphilitic disease of an artery, or syphilitic arteritis, and the condition designated atheroma. The latter requires years for its development; syphilis effects its changes within a few months. While atheroma is apt to involve a large extent of the arterial system, syphilis attacks perhaps a single vessel, and is circumscribed. The syphilitic process results in a new growth, or hypertrophy, composed of elements foreign to the part; atheroma is probably a result of impaired nutrition, it having been observed to co-exist with

endarteritis of the *nutrient* vessel of the affected artery. Although atheroma commonly occurs at a more advanced period of life than syphilis, it is erroneous to suppose that the former is a disease exclusively of old age, since it has been met with as early as the ninth year. As a rule, however, syphilitic arteritis is found in subjects younger than those affected with atheroma, but it is not uncommon to find the two lesions combined.

In syphilitic arteritis an artery may be almost blocked up by the thickening of its walls, or, on the other hand and more rarely, degeneration of the cellular deposit may occur and so weaken the arterial wall as to lead to the formation of an aneurism. This latter result is so frequent in the case of cerebral arteries, that, in the opinion of some observers, at least one half the cases of intracranial aneurism are due to syphilitic infection.

Disease of the walls of the *larger* arteries may undoubtedly result from the general condition of mal-nutrition dependent upon syphilitic cachexia, but, as yet, lesions similar to those found in the vessels of the brain have not been positively demonstrated in any of the large arteries, except the carotids.

In the following case there is no evidence to show that the pathological changes in the wall of the artery were specific, yet in the absence of an exciting cause of aneurism and of signs of atheromatous degeneration in other arteries, it is reasonable to conclude that syphilis was the primary cause of the lesion of the aorta.

The patient was a man forty-two years of age, a horse-dealer by trade, of moderate habits in the use of liquor, of good constitution, and furnishing an unexceptionable family history. He gave a history of syphilis contracted twelve years ago, but there had been no visible manifestations of the disease for many years. The secondary symptoms included the usual roseola and a limited papular syphilide, sore throat, alopecia, and osteocopic pains.

With this exception, he had never been ill, and there was nothing in his habits or mode of life predisposing him to disease. Five years ago he was thrown from a horse and was somewhat bruised about the chest and shoulders, but the accident was considered of no consequence, and did not interfere with his usual occupation. Two years ago he had what he called an attack of "asthma," following exposure to cold. The voice was then partially lost, and never afterward became entirely normal. He subsequently had several attacks of difficult breathing, and when first seen at the throat clinic of the Manhattan Eye and Ear Hospital, Sept. 5, 1882, he was almost completely aphonic, and suffered greatly from dyspnœa on the least excitement or exertion. When absolutely quiet the breathing was easy and natural, with the exception of being slightly wheezing; after a few moments' use of the voice, or after quickly walking across the room, the breathing became rapid and labored.

Examination with the laryngoscope showed incomplete paralysis of the left vocal cord, with moderate congestion of the larynx, but did not explain the spasmodic disturbance of respiration, since, during a period of excitement, the vocal cords were found to be widely separated.

Examination of the chest gave somewhat meagre results. The percussion note was dull at the upper part of the chest, and the respiratory sounds were feeble on the left side. The heart-sounds at the base were confused and indistinct. The apex beat was normal. A feeble murmur, diffused under each clavicle, and heard also in the interscapular region, was thought to be detected with cardiac systole. In addition, pulsation in the left radial artery was hardly perceptible. There was no deformity of the chest-wall, but the extrathoracic veins were extremely turgid. There was no complaint of pain, but a feeling of constriction of the chest was spoken of, especially marked during an attack of spasm.

This patient was married about two years after having contracted syphilis, the wife aborting at four months. In the following year a boy was born, who is still living, but he has always been "sickly," although, so far as can be ascertained, he has had no positive signs of hereditary syphilis. The birth of this boy was followed by four miscarriages, until one year ago a living child was born, who is decidedly marasmic. The wife has never given indication of syphilitic infection, and is a strong, healthy woman.

In view of his syphilitic history and of the probable existence

of an aneurism of the aortic arch, the patient was given the iodide of potash, to be gradually increased in accordance with toleration of the drug, and he was directed to keep at rest as much as possible. On account of the discomfort resulting, he was unable to take more than a drachm of potash in divided doses during the day. Under this treatment he went on very comfortably until early in November, 1882, when he had a very violent attack of dyspnœa, which was relieved by morphia hypodermically. In this instance only the attack, which developed gradually, was preceded by a slight chill, and it was followed for several days by cough with rather free muco-purulent expectoration. Its duration was about twelve hours. Two more comparatively slight attacks, lasting only three or four hours, occurred in the course of three weeks, and another in the latter part of December, which were promptly checked with morphia. The great labor involved in getting the breath during a spasm left the patient completely worn out. He became weak and emaciated, although his appetite was good and there was no dysphagia. In January, 1883, having had no trouble for nearly a month, he was feeling somewhat stronger, and on the 19th he went out of the house for the first time in several weeks. On returning to his home he was very much exhausted and distressed for breath. During the night the difficulty increased, and at 4 P.M., January 20th, I found him excessively cyanosed and in a condition of semi-consciousness. He was sitting upright in bed with the body thrown forward, a position always assumed in previous attacks of spasm, as giving the most comparative ease. The surface of the body was cool and bathed in perspiration. Respirations were twenty-six to the minute, inspiration being rapid and noisy, while the act of expiration was twice as long and was accomplished by great muscular effort. Temperature was normal ; pulse 148 and feeble, the left radial being pulseless. Physical signs were unsatisfactory. Morphia and nitrite of amyl gave only partial relief, the semi-comatose condition persisted, and death occurred at 5 P.M.

Permission was given to examine the heart only. On opening the thorax the ascending aorta was seen to be dilated to at least twice its natural size. In attempting to remove the heart, it was found necessary to dissect from the spinal column an immense aneurism of the aortic arch, which had deeply eroded the bodies of the second and third dorsal vertebræ. The aneurismal tumor was fusiform, and involved the entire arch. The root of the left lung and the trachea at its bifurcation were compressed by the

tumor and were adherent to it. The parts were so matted together as to be distinguishable with difficulty. On laying open the aneurism a large, firm, and partially decolorized clot was found to occupy its posterior portion. There was no indication of hemorrhage having occurred, nor were there any signs of ulceration or threatening rupture of the sac, the walls of which were thick and apparently atheromatous, patches of calcareous material being distributed here and there. One of these plates completely covered the entrance to the left subclavian artery, and that vessel was extremely narrowed for the first inch of its course. The calibre of the left carotid artery and that of the innominate were somewhat increased. The heart was slightly hypertrophied. Unfortunately, a search for visceral syphilis as well as a minute examination of the aneurismal tumor itself were prohibited.

In view of the great size of the aneurism, and the degree to which the vertebræ and the root of the left lung were involved, the absence of subjective symptoms is remarkable. Boring pain, often referred to in cases of aneurism eroding the spine, was absent throughout. Disorders of vision and cerebral disturbance were never manifested. For a few days after each respiratory spasm, there was cough, with moderate expectoration, but otherwise the intervals were marked by no symptom except impairment of voice.

It is to be noticed that the syphilis acquired twelve years ago was of mild type, and received very irregular and imperfect treatment. It could not be determined that any of the so-called tertiary symptoms had ever developed.

The only injury or accident ever sustained by the patient, was the fall from a horse, referred to at the beginning of the history, and from the account given of that injury, it would appear to have been insufficient to produce an aneurism of a healthy artery.

There is great diversity of opinion regarding the part syphilis plays in the causation of aneurism of large arteries, yet it seems to be conceded that it is at least a pre-

disposing cause, together with other agencies, such as rheumatism and excessive use of alcohol. There are few reliable instances of aneurism traceable to distinct syphilitic disease of the arterial wall. Lancereaux refers to two cases, related by Lancisi, of subclavian aneurism "resulting from venereal cachexia," but there is nothing in the brief histories of either of these cases to show that the pathological changes in the artery were syphilitic. Strange to say, they were aggravated by bleeding and purging, but recovered under mercury and sudorifics. The same author also records an observation by Weber of a gummy tumor, the size of a bean, developed in the middle coat, and projecting into the lumen of the pulmonary artery, similar deposits being found also in the brain and liver. Lancereaux himself has described a lesion, which he regarded as syphilitic, of the left carotid artery, at the origin of the lingual, in a patient with other marked symptoms of syphilis; in the same case he found deposits in the wall of the aorta, of the exact nature of which he was uncertain. In a case of syphilis in a young girl, who died of interstitial nephritis, Virchow found sclerotic and atheromatous patches in the aorta, and Huber (*Virchow's Arch.*, 1880) relates the case of a woman, twenty-two years of age, who died about a year after having contracted syphilis, and in whom nearly all the arteries, *except the cerebral*, were diseased, many of the veins also having suffered.

In the latter case no aneurisms were discovered, but the condition which might in time lead to dilatation of the artery consisted of yellowish patches of thickening and of calcification, the calibre of the vessel being diminished and some of the arteries being entirely occluded. Considering the youth of this patient and the absence of all other causes, the lesion is believed to have been due to syphilis, although it was found to be not pathologically identical with what has usually been described as syphilitic.

A case giving perhaps the most satisfactory evidence in favor of what may be called syphilitic aneurism was reported by McNalty in the *Medical Times and Gazette*, May 3, 1873.

A man of middle age gave symptoms of aneurism of the aorta about five years after having had a chancre. The post-mortem showed an aneurism of the aorta and one of the innominate, and gummatous elevations on the inner surface of the arch with erosion of the wall of the aorta. Gummata were found also in the spleen and liver.

In a paper read before the Med.-Chir. Society in 1875, Welch strongly maintained the prevalence of syphilitic aneurism in the English army. Making allowance for contributing causes peculiar to the life of the soldier, it seemed to be true that a very large proportion of aneurisms in this class of men developed in syphilitics. The lesion found by him and considered specific was a fibroid growth chiefly in the inner coat of the artery. In his opinion this growth might in some cases retrogress, without leaving any serious deformity, or, on the contrary, it might disintegrate and so weaken the wall of the artery as to result in aneurism.

The evidence thus far accumulated seems to show, therefore, that syphilis is a common predisposing cause of aneurism ; that in rare cases syphilitic new growths do develop in the wall of a large artery, the subject of such lesion at the same time presenting similar lesions of one or more of the viscera.

SOME OBSERVATIONS UPON INJURIES OF THE EYE, WITH ILLUSTRATIVE CASES.

By THOS. R. POOLEY, M.D.,

OF NEW YORK.

THERE is no class of cases which require more careful and delicate treatment than injuries of the eyeball, necessitating, as they do, at the same time, both diagnostic acumen and surgical skill.

In the following paper it is the purport of the writer to report a number of the more important cases of this kind which have come under his care, in private practice, during the last few years, and which he has had the opportunity of following to their termination; together with such observations of diagnosis and treatment as they may suggest. The remarks which may seem to be of importance will be made to follow directly after the report of each case, the details of which will be given as succinctly as possible, and embracing only the important features of the case. In two of the cases, some experience with the magnet, both in the attempt to locate the position of the foreign body and remove it by the aid of a magnet, a subject which has of late excited much interest and discussion, will be related.

CASE I.—*Penetration of the eye by a large foreign body.* The particular interest of the case lies in the large size of the foreign body. The patient, a man of twenty-five, came to my office, Jan.

25, 1880. A few hours before, while working at boiler-making, a piece of steel struck his right eye. He was very positive in his belief that no foreign substance remained in the eye. There was a large wound on the inner sclero-corneal margin, extending from thence on to the cornea; the iris was in the wound, there was traumatic cataract, and some blood in the anterior chamber. The eyeball was soft, but good perception of light remained. Incision of the prolapsed iris was immediately done, the eye bandaged, and the patient sent to the Ophthalmic Institute. The following day, while trying to remove some clot from the wound, the forceps seemed to strike against some foreign body. A probe was carefully used, and the click of its contact against a foreign substance distinctly felt. With a pair of fixation forceps, it was grasped and removed. It proved to be a large piece of iron about 1″ long by $\frac{1}{8}$″ wide in its largest diameter, of irregular, jagged shape. Pain, which had been severe, now ceased, and panophthalmitis with subsequent phthisis bulbi ensued. March 2d, patient was discharged.

CASE 2.—*Foreign body in the eye. Attempt at removal with a magnet. Enucleation.*—N. K., fifty years old. Consulted me June 7, 1880. On Jan. 22d, of the same year, while knocking off a hoop from a barrel, with a chisel, a piece of steel flew from the latter and struck him on the left eye. There was immediate loss of sight and a luminous circle before the eye. He recovered sufficient vision to distinguish large objects, and had no further trouble or pain in the eye until a few days before consulting me, when very intense pain set in, and he lost all perception of objects. The examination of the eye at this time gave the following result: eye very much injected; iris discolored; pupil moderately wide; a small linear scar about 2‴ long in the vertical meridian, at the lower and somewhat inner part of the cornea, about 1‴ from its margin. The iris was wounded and the lens cataractous. There was intense iritis, most marked in the immediate vicinity of the wound, and the eyeball, especially over its lower part, very sensitive to the touch. Perception of light was good and the field of vision complete. A test to ascertain the position of the foreign body which was supposed to be in the eye was made, by the method suggested by me, with a suspended magnetic needle; there was a distinct deflection of the needle at a point obliquely downward and inward from the point of entrance of the foreign body, indicating its position near the surface. The next day I attempted the removal of the foreign body. A lower section, within the

cornea, close to the scleral junction was made with a Gräfe's knife, iridectomy was then done, and the cataractous lens let out. Attempts were then made to bring Gruening's permanent magnet in contact with the foreign body, by passing its point carefully around in every direction, but they all failed. The eyeball was therefore enucleated, as had been agreed upon, if the attempt to get the foreign body should fail.

Upon opening the globe after its removal a small chip of steel about 2 mm. long by $\frac{1}{2}$ mm. wide was found in the inner, lower ciliary region. It was so completely invested by a capsulating membrane that it could with difficulty be removed from the membrane surrounding it.

From a consideration of the course of the symptoms developed in this case, it would appear that the foreign body first found a lodgment in the lens. Until it became quite opaque the patient retained some sight, but so soon as the cataract was complete this was lost. In this position, too, the presence of the foreign body gave rise to no pain, but when the severe pain set in it is probable the foreign body became dislodged from the lens and came in contact with the ciliary processes. In the *Archives of Ophthalmology*, vol. ix, pp. 219 and 255, I published an account of a method of detecting the position of suspected steel or iron foreign bodies in the eye by the means of a suspended magnet. In this case, as mentioned in the account of it, there seemed to be a decided indication, by the deflection of the needle when held over one place, as to the presence of the foreign body. The activity, too, with which the needle acted made me think the foreign body lay near the surface. It will be observed that the fragment of steel was subsequently found to lie in the position thus indicated. Since I wrote the article referred to I have tried the method in many cases, and must confess that I have been disappointed in its general applicability to clinical practice, although the results which I obtained in my experiments were very definite. In this case, however, the

indications thus given, as observed by myself and others, were unequivocal enough. I have, in many other instances, nevertheless, failed to receive any reliable information from this method of examination. At this time, and in this place, I will not take up any more space, but hope to revert to this subject again before long in a special communication.

The cause of the failure to remove the piece of steel with the magnet was easily enough explained after dissecting the globe. It lay in the fact that the foreign body was encysted or enveloped in a sort of exudate. Nor is this fact fatal to the view advanced, that the foreign body had been only a short time in the position where I found it. In the experiments which I carried on, described in the paper already referred to, the introduction of such foreign bodies into the eyes of rabbits was followed by the enveloping of the substance in a dense exudation as soon as twenty-four or forty-eight hours after their introduction. The same observation has been made by Pagenstecher in the *Archives of Ophthalmology and Otology*, vol. i, p. 535. Without entering to any considerable extent into a consideration of the availability of the magnet for the removal of steel and iron fragments from the interior of the eye, I would call attention to this fact, and suggest that the method will find its limits to those exceptional cases in which the foreign body can be seen to lie free in the vitreous chamber, and the operation conducted under proper ophthalmoscopic illumination.

CASE 3.—*Foreign body in the sclero-corneal margin—Removed by the magnet.* December 27, 1880, J. R., æt. fifty, consulted me by the advice of his physician, Dr. Campbell, of Mount Vernon. Four hours before he was engaged in knocking the hoop from a barrel of flour, when a piece of steel struck him upon the left eye. He went at once to the doctor, who could see the piece, but was

unable to remove it. When I examined his eye by oblique illumination, I could distinctly see a small penetrating wound in the sclero-corneal margin, on its outer, lower side; upon close inspection, there seemed to be a foreign body in the bottom of the wound. When the magnetic needle was held over the wound it showed by its deflection the presence of steel or iron. Attempts were now made to remove it with Gruening's magnet, and then to catch hold of it with the forceps, but they all failed. It was now loosened by means of Knapp's foreign body-hook; and then the magnet, brought in contact with it, successfully drew out a small spiculum of steel about 2 mm. long, with a sharp end which stuck into the sclera. The anterior chamber was now emptied, and the tension of the eyeball reduced; $V = \frac{20}{200}$. Three days later the tension of the eye was normal, and $V = \frac{20}{20}$.

In this case we have an example of the use of the magnet where the foreign body has not penetrated completely, and the removal of the body was greatly facilitated by the use of the magnet. By the same means, too, any doubt as to the presence of the foreign body in the depths of the wound were cleared up, without resorting to probing, which might have pushed it farther into the eye.

CASE 4.—*Foreign body in the iris—Suppurative iritis—Removal of foreign body—Cure.* W. A. H. consulted me on January 20, 1882. A day or two before while out shooting, through some defect in the breech of the gun, the powder escaped with great force and struck him in the face and eye. Upon examination, a number of grains of powder were found embedded in the cheek and brow; there were also a number of points on the cornea of the right eye, which marked the places from which a number of powder grains had been removed by Dr. Everett, of Middletown, N. Y. To the upper and outer side of the vertical meridian of the eyeball a grain of gunpowder was seen in the iris, close to its ciliary border. There was some iritis, and pus in the bottom of the anterior chamber. $S = \frac{20}{200}$, and the field of vision was intact. With the ophthalmoscope a good reflex from the fundus could be obtained, but no details could be made out. There was very severe pain in the eye, and over the head on the affected side. He was directed to lie in bed, put leeches on the temple, and a one-per-cent. solution

of sulphate of atropine in the eye every two hours. Three days later the pain had very much diminished, the hypopyon gone, but the pupil was only moderately dilated. On the day following the pain had again increased in severity; there was more circumcorneal injection, and chemosis. During the night the pain was intense, and early on the morning of the 25th I was called to see him. The lids were swollen, the chemosis increased, and the least touch over the region where the foreign body lay gave the most exquisite pain. Inasmuch as it was evident that cyclitis as well as iritis was now present, I resolved to attempt the removal of the foreign body at once. The patient being under the influence of ether, I made an incision near the sclero-corneal margin, corresponding to the position of the foreign body, with a Gräfe's cataract-knife. On the completion of the section, the iris, which prolapsed in the wound, was seized, cut off, and in it was embedded the powder grain. A pressure bandage was now applied, and the patient kept in bed. The next day the patient, who had slept well during the night, was entirely free from pain; the swelling of the lids and conjunctiva much diminished. There was now a rapid diminution of all unfavorable symptoms, and on the 31st of December the patient could be discharged, with vision of $\frac{20}{30}$. Upon a careful examination of the eye by oblique illumination, a thin filament was seen to extend from the sphincter margin of the coloboma of the iris to the cornea, and in the iris at this point another grain of powder could now be seen. This had entirely escaped notice before; and when it is remembered how swollen the iris was from the intense iritis, it is not surprising that such should have been the case. I have seen the patient several times since he left the city, and his eye remains perfectly free from pain or irritation. There is a very small coloboma of the iris; the powder grain in the pupillary part of the iris can be plainly seen; and vision is as good as in the other eye, $\frac{20}{20}$.

There are, it seems to me, some interesting and practical features in this case. That grains of gunpowder can be driven with sufficient force not only to penetrate the cornea, but even to enter the lens and deeper interior parts of the eye, is known to those who see many cases of injury of this organ. In 1871 I published several cases of the kind in the *New York Medical Journal*, the same being a paper

read before the New York Medical Journal Association. In one of the cases there referred to, a grain of powder remained permanently in the lens, without provoking any disturbance. It is well known, too, that grains of gunpowder embedded in the cornea give rise to far less irritation than other foreign bodies, and that unless they lie right over the pupil, it is just as well not to be too meddlesome in attempts for their removal. With these facts in mind, I thought they might be equally innocuous in the iris, and therefore did not at once attempt the removal of the powder grain, which I saw. This would have, in all probability, been the case had both the one I removed and the one which remained been in the same location. For, I believe, the disturbance caused and which was sufficient to menace the safety of the eye, arose entirely from the one in the ciliary region. When this was removed, the eye at once improved, and the one in the other part of the iris seemed to offer no obstacle to the favorable progress of the case, and remains to this day without causing trouble. It is well known that it is this region of the eye which especially resents injury of any sort, and the removal of the foreign body and contused iris at once gave a chance for recovery. The presence of inflammation of the ciliary body, as well as of the iris, was demonstrated by the pain on pressure, which is not a feature of uncomplicated iritis.

CASE 5.—*Penetrating wound of the right eye—Sympathetic inflammation of the left.* July 8, 1882. Dr. Campbell, of Mount Vernon, referred to me the seven-year-old daughter of P. H.. on account of an injury of the right eye received the day before. The child was standing under a tree, in which a boy was picking cherries, when he dislodged a dead branch which struck her forcibly upon the right eye. There was a wound in the sclero-corneal margin, which extended by a flap upon the cornea; prolapse of iris into the wound, blood in the anterior chamber, and probably cataract, although this was difficult to decide on

account of the presence of the blood. The eye was very much injected, but not at all painful. Fingers could be counted close to the eye. The eyeball was soft, and the impression I gained was that the penetrating substance had entered very deeply ; however, no foreign body seemed to have remained in the eye. The father was directed to leave the child in the city, and the same day, in the afternoon, I carefully removed the iris from the wound, leaving a free coloboma, without any incarceration of iris ; kept her in bed, with a pressure bandage applied to both eyes, in a dark room, and had atropine instilled three times a day.

A rapid diminution in all unfavorable symptoms took place. The blood absorbed, the eyeball less injected. In one week the patient was discharged from treatment, and the father allowed to take her home. Particular care was taken to explain the danger of sympathetic ophthalmia, and the advice to return at once, if any symptoms of irritation should occur in the other eye, was enjoined. I saw the patient only once after she had returned; then the injured eye was improved, and the other perfectly free from irritation. Soon after I left for my summer vacation, and directed the father to take the child to see Dr. Moore, during my absence. I was careful to explain to him the danger of sympathetic trouble in the other eye, and the necessity to see the doctor at infrequent intervals. Upon my return from the country Dr. Moore reported that the eye was looking badly, and advised that I should see the patient as soon as possible. I therefore requested the father to bring the child to me as soon as possible, which he did on Aug. 14th.

The eye now showed a marked change : there was anterior phthisis, a deeply-indrawn scar, and the eye was sensitive to the slightest pressure made over the ciliary region.

In the left eye there existed marked circumcorneal injection; the pupil was sluggish, but there were no adhesions, nor decided evidence of iritis. Inasmuch as there was irido-cyclitis of the injured eye, and beginning sympathetic inflammation of the other, I suggested immediate enucleation of the injured one, but in view of the serious nature of the case, suggested consultation with Dr. Knapp. The child was taken to him the same day, and he concurred in my advice. Accordingly, the next day, assisted by Drs. C. S. Ward and S. Beach Jones, I removed the right eye—the child being under ether. Both on the morning of the 14th, and again before the operation, I had put a drop of a one per-cent. solution of atropine in the left eye, with

the effect of producing only a moderate dilatation of the pupil. Immediately following the operation there was a marked amelioration of the condition of the other eye. The pupil became more dilated, the injection less, and for the moment I was in hope the removal of the lost eye was to be followed by the arrest of all sympathetic trouble, but in this hope I was soon to be doomed to disappointment. For two days the improvement seemed to be maintained, but on the 17th inst. I found the eye much more injected ; small synechiæ below and inward, with a number of small dots on the innermost layer of the cornea and anterior capsule of the lens. The vitreous, too, in the same locality was diffusely opaque, and the vision very much obscured, six leeches were put on the temple, the instillations of atropine repeated every two hours, and inunctions with strong mercurial ointment made twice a day. For the next two days there seemed to be a slight improvement, but on the 19th the eye was worse, and I again asked to have Dr. Knapp in consultation. He agreed with me in the opinion that there was a serous irido-cylitis, of a sympathetic origin, and at my suggestion we agreed to include in the plan of treatment already instituted, the systematic applications of hot-water compresses, as recommended by Dr. Ayres, of Cincinnati, *Archives of Ophthalmology*, vol. xi, p. 199.

These applications, which were made by a carefully trained nurse, consisted in the application of hot compresses, which were changed every few moments, for six or eight hours a day, but not as Ayres recommends,—the use of flaxseed poultices. Both Dr. Knapp and myself made an ophthalmoscopic examination, and ascertained that there was no neuro-retinitis. For a number of days this plan of treatment seemed to be followed by improvement. It was especially noticeable that after the continuous application of the compresses, the redness of the eye would be increased for a time and then become less again. The punctate dots on the cornea remained about the same. On the 29th the eye was worse, more deeply injected, and the periphery of the iris began to be retracted; the ophthalmoscope still showed no changes in the fundus. There was no evidence of any constitutional effects of the mercury, although it had been continued all this time, both by inunction, and small doses of calomel internally. Leeches were again applied. From this time onward, to Sept. 9th, when Dr. Knapp again saw the case in consultation, the eye gradually became worse. The cornea was more opaque ; the pupil contracted, and its periphery retracted ; the iris changed to a dirty

color, and bosselated. The vitreous had now become so opaque that it was almost impossible to obtain a reflex from the fundus, and fingers could only be counted at 10'. From this time on until the end of September, the eye was alternately better and worse, but the disease made steady progress, and the appearance of the eye became more and more characteristic of sympathetic irido-cyclitis. Several times the mercurial treatment was carried just to the point of ptyalism, temporarily suspended, and then resumed, but never did it seem to arrest in any way the progress of the disease.

Oct. 3d.—The patient was allowed to return home with the instruction to still keep her confined to a darkened room, and to continue the use of the hot applications. Nov. 30th, I went out in the country to see the patient. The iris was swollen, nodular, discolored; the pupil small, and its area invaded by exudation; anterior chamber shallow, and tension of the globe somewhat diminished. The ophthalmoscopic illumination only gave a dull reflex, but no details could be made out. Fingers were counted with difficulty at 5'. There was no pain in the eye. As the mercury, which had been continued under the direction of the family physician had produced quite a bad stomatitis, I directed that it should be stopped. The warm applications, too, which had been continued uninterruptedly since the patient left the city, were discontinued, a simple tonic with the use of chlorate of potash for the mouth prescribed, and the parents directed to take the child out, protecting the eyes by the use of blue glasses. I have only seen the patient once since, and then the disease had still more advanced.

Within a few days since beginning to write this article, I have been visited by the child's father, who tells me that the eye still continues very red, and that she is almost entirely blind, scarcely being able to discern even large objects. Whether any thing more can be done must be a question for further decision when all inflammatory symptoms have ceased.

An examination of the injured eyeball has not yet been made.

It is a number of years since I have had the misfortune to have a case of sympathetic inflammation under my care, and it must be confessed, that no conscientious practitioner will desire often to encounter such a distressing experience. The last case which I treated, terminated almost as badly,

although the boy in this instance, so long as he was under observation, retained a moderate amount of vision. The case is published in a paper, on "Sympathetic Ophthalmia," in the *New York Medical Journal*, Oct., 1870.

It is a cause of great regret to me, that, in my absence, the case we have now reported was so long from under my observation. The patient was seen only once by Dr. Moore in my absence from the city, and did not return to him although strictly enjoined to do so; the father did not bring the child to me until a week after my return, and then only after I had sent him a request to do so. Had either Dr. Moore or myself seen the case sooner, the sad termination might have been averted, by the more timely removal of the injured and painful eye. As it is, the development of the sympathetic trouble in the other eye occurred unusually early, for when seen by Dr. Moore, the left eye had no symptoms of sympathetic diease, whereas three weeks later, when I saw it, the left eye showed deep-seated pericorneal injection.

It is quite impossible and out of proportion to the space allowed in such a paper as this to consider, to any great extent, such an important subject as sympathetic transmission of an inflammatory process from one eye to the other. We shall be contented to point out such lessons as the case offers, which are mainly to show the utter futility of all the therapeutic plans resorted to. In the first place, the experience afforded by this case is an additional proof that enucleation of the injured eye does not arrest or shorten the duration of the disease when once it has begun. To be of any service, this must be done before there is any beginning of inflammation in the second eye. For a day or two a hope sprang up that this case was going to offer an exception to this, I believe, universally conceded rule. Of just as little avail seemed to be the strictly antiphlogistic plan of

treatment, by mercury, leeches, and so forth, which is certainly of such great importance in other inflammatory diseases of the eye.

Having in mind the good results reported by Dr. Ayres of the use of poultices, reported in his paper,[1] I entered upon their use with some degree of hope; but I cannot see that they did any more than the most temporary good, and even that was questionable. I would not, of course, venture to decide upon the value of any plan of treatment from the experience afforded by one case, and in the light of Dr. Ayres' experience, would try it again. It is possible, too, that the use of hot flaxseed poultices, as he recommends, is better than the mode I employed, which consisted in placing small pads of spongio-piline in hot water, laying them on the eye, and having them changed every few moments.

For me, the truth seems to be, that we are powerless to arrest the destructive course of a sympathetic inflammatory process once awakened, and it would seem that such a case may as well be left to the resources of nature.

As to the question whether any sight can be restored by operative procedure on the injured eye, it is certain that none should be attempted until all inflammatory symptoms have disappeared. An iridectomy then may in exceptional cases meet with some success. In one such instance I have succeeded in restoring quite useful vision, but the operation is usually followed by reaction and filling of the pupil with lymph. If done during the active stage of the disease, the operation not only does not check but probably aggravates the disease. Since I have not yet examined the enucleated eye, I cannot tell whether the conditions would throw any light upon the question as to the mode of propagation of the sympathetic disease, which is a subject of too

[1] *L. c.*

great a length to say much about. This, indeed, is a question which, after apparently having been once settled, is again recently revived: the old view, that the course of the propagation may be by way of the lymphatic spaces of the optic nerve, again finding many partisans; while some even go so far as to deny the view which has so long been considered orthodox, that sympathetic ophthalmitis is explained by reflex action through the ciliary nerve. With the careful experimental studies and anatomical and microscopical researches which are now being made on this question, we may hope, in the near future, to have it definitely settled. Let us hope that with the discovery will come some suggestion of value as to the treatment of this dreadful disease, which would be, indeed, a great boon. In conclusion, I would simply call attention to a fact observed as well by others I have talked with, although I have not seen it in print, that sympathetic ophthalmia is a disease more common in childhood than in adult life, for which, however, I have no explanation to offer.

HISTOLOGY OF THE PSYCHO-MOTOR REGION IN THE NEWLY-BORN.*

By DR. MAGALHAES E LEMOS,

OF PORTO.

Translated by George B. Phelps, M.D., Watertown, New York.

THE cortical layer of the paracentral lobule of the newly-born has a thickness of about three millimetres, and, on an examination with the naked eye, may be divided into three nearly equal zones. A more careful study, although without the aid of the microscope, shows that the third zone, that is, the most internal (plate I, 7, the deep part has not been figured), has a color sensibly uniform and lighter than that of the central part of the convolution. But this uniformity of color does not exist in the second zone or in the first. In fact the former presents three striations, two of which (plate I, 4, 6), deeply colored and having the same thickness, are separated by a third, rather pale (plate I, 5); and the latter, which is the more external, is formed by a pale striation (plate I, 3) enveloped by another reddish band (2); finally, this last is covered by a pale border, quite thin yet demonstrable in some preparations.

Thus by its chromatic properties the cerebral cortex is divisible on macroscopic examination into seven layers,

* Chapter II from A Regiao Psychomotriz. Dissertaçao Inaugural Apresentada e defendida na Eocóla Medico-Cirurgica do Porto por Antonio de Sousa Magalhaes e Lemos.

alternately light and dark. The first layer is made up of an interstitial substance, in the midst of which appear some cells of small dimensions containing nuclei relatively so large that they form the greater part of the cellular mass. The second is sharply defined from the first by the abrupt aggregation of a great number of cells, larger

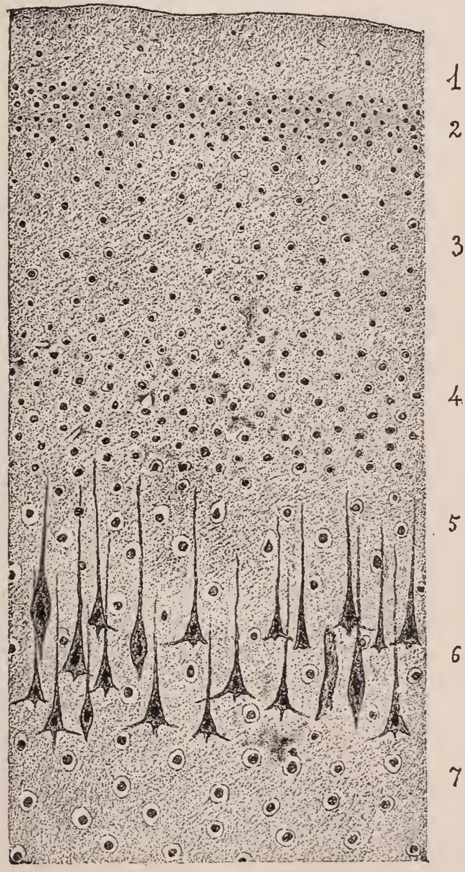

PLATE I.

than those of the preceding layer, and containing nuclei which more easily fix carmine. It gradually merges into the next.

In this layer the cells are more scattered than in the preceding, and for a given area there are about one half the number of cells that one may see there. This is its principal histological characteristic, though the cells, too, are a little larger. In the midst of the cellular protoplasm, which is almost indifferent to carmine, a spherical and strongly-colored nucleus appears.

The fourth layer is formed by a new condensation of cells, but as this condensation is not formed as abruptly as in the passage of the first into the second layer its external limit is not as well defined.

On examining the deepest parts, one sees that the cells gradually separate, as happens in the change from the second into the third layer, and form the fifth layer. Here, however, the separation of the cells does not appear as marked. The sixth layer gets its characteristics from the appearance of new cellular elements which I now describe. The cells of the fifth layer do not undergo in this situation a noticeable change either in structure or distribution. They are the same, too, in the seventh layer. So that if it were not for the appearance of characteristic nervous elements in the sixth layer, the cortex of this layer would be reduced to five strata, formed by the alternate aggregation and separation of nerve-cells more or less round, without prolongations, formed of a protoplasm nearly indifferent to carmine, and enclosing a nucleus which shows an affinity for this coloring material. I resume the study of the nervous elements of the sixth layer to which I have called attention, and which constitute, as I hope to show, a ruling element in the histological description of this region. They are pyramidal, having a height of from 30 μ to 40 μ, and a breadth from 9 μ to 15 μ.

Some do not attain these dimensions, but others among them attain a height of 65 μ and a width of 20 μ. These

elements are dispersed among round cells having a diameter of 20 μ to 30 μ, to which I have already referred.

The pyramidal cells are colored by carmine, and enclose a nucleus generally ovoid or elliptical, which, in the largest cells, may have a diameter of 9 μ to 15 μ. These cells send out several prolongations, the most developed of which is at the apex. This prolongation, formed by the gradual narrowing of the cellular pyramid with which it is insensibly continuous, takes a centrifugal course, and one may follow it a distance of two, three, four or five times the height of the cells. Next to the prolongation from the summit one finds them most plainly at the base of the pyramid. Here they appear almost always from the lateral parts, the angles, but it is not rare to see one arise from the centre. They tend to take a more or less centripetal direction, which in the central prolongation is constant. These pyramidal cells are located in the sixth layer. However, one may see them in the fifth or even in the fourth layer, though they are seen exceptionally and are of small dimensions, the sixth being always the favorite site, and in several preparations all the cells may be confined in it.[1]

A moderate enlargement suffices for their study. One sees, then, that they are not arranged in a continuous series, as one observes in the cornu Ammonis, but in an irregularly interrupted series in a manner to form more or less circumscribed aggregations of cells. In some parts these groups are not at first well seen. Plate I. shows the more common arrangement. The facts which have been shown

[1]Although I give much attention to the site of the nerve-cells of the strata in the interpretation of their functions, I am far from giving to it an absolute importance, since, in preparations of the spinal cord I have noticed in the posterior half of the posterior horns, cells which possessed the structure of cells forming the anterior horns. There is a true change in the position of the medullary cells of the anterior horns, and there is no reason why the same thing may not happen in any layer among the cerebral cells. Finally, when, in describing a stratum, I assign to it, as characteristic, the presence of a certain kind of cells, I do not at all wish to imply that it is impossible to find them outside this stratum.

lead me to conclude that among all the cells of the paracentral lobule the large pyramidal cells are remarkable for the precocity of their development, as judged by their morphological and molecular structure.[1]

It ought to be the same in the central convolutions which are in all respects so analogous to the paracentral lobule. Now, as at this period of life, the pyramidal tracts already exist in an advanced state of development in this superior part, intrahemispherical, as is asserted in the first part of this work, I must conclude that they are formed from these cells.[2] But at this period of life, at birth, what is the structure of the other cerebral convolutions?

In order to answer this question I have directed my researches to three different parts of the brain of the same subject: (*a*) The internal frontal lobe comprising the two convolutions—that is to say, all the surface which is vertically raised above the corpus callosum. (*b*) The second frontal convolution. (*c*) The cornu Ammonis.

(*a*) The sections of the internal frontal lobe were made at its middle third.

In order to render a concise description of my observations in this part of the brain more easy, I take for the starting-point the segment of the cortex corresponding to the calloso-marginal fissure, for the very simple reason that it being in this segment of the cortex that the strata are most sharply defined, it will be easy to distinguish them, and afterward not difficult to follow them.

In the deep part of the fissure a pale zone exists, bent on itself, the concavity directed toward the interhemispherical fissure. This zone is divided into two unequal parts by a delicate red striation, situated a little internal to its central

[1] I consider the affinity of these cells for carmine the test of their molecular development.

[2] We have here a demonstration of the fruitfulness of this method of anatomical investigation, which attempts to discover the connection of parts of organs at the period of their development.

part, and it is limited internally and externally by two quite thin reddish zones. These five zones may be traced into the inferior convolution, gyrus fornicatus, at the summit of which they blend somewhat to become afterward distinct in the part of the convolution belonging to the bottom of the fissure which separates it from the corpus callosum. In the superior convolution, which is only the internal face of the first frontal convolution, one observes also the same lack of clearness in the differentiation of the zones. In studying these sections with the microscope, and in examining the part which corresponds to the bottom of the calloso-marginal fissure, the true point of origin, one observes only round cells containing nuclei of the same form.

In the whole extent of the two pale zones the cells are quite large, and fix little carmine. The red striation which separates them is formed of small cells more readily stained by this substance. In studying this striation in the superior convolution one observes a series of small cells, deeply stained with carmine, which send off prolongations. The most developed, some straight, some twisted, are directed toward the surface of the convolution and give to the cells a pyramidal form.

But a very marked difference exists between these cells and the cells I have described in the sixth layer of the paracentral convolution, in regard to their form, dimensions, structure, and texture. Every thing indicates that the pyramidal cells of the paracentral lobule are in a much more advanced state of development. Scattered through the remainder of the cortex are some cells which, sending off centrifugal prolongations, commence to assume the pyramidal form. One observes nearly the same structure in the part of the section belonging to the convolution of the corpus callosum.

In conclusion we have this important fact: that, although

the internal face of the first frontal convolution is a continuation of the paracentral lobule, and at a little distance from it, nevertheless it belongs to another region of the cerebral cortex essentially distinct when viewed from its histological formation.

(*b*) I now take up the study of the second frontal convolution. The sections were made at its middle third. Inspection shows a striation very similar to that of the internal frontal lobe, but not equally marked on the two surfaces of the convolution. Indeed, here also a thin red striation appears, situated nearly in the middle of a large pale zone which it subdivides into two ; and in each of these, one sees, with the microscope, a structure too similar to that I have just described to need a separate description.

But in several sections I have found in this striation a structure very similar, almost identical, to that which I have described in the sixth layer of the paracentral lobule, namely, pyramidal cells, which, by their form, structure, and disposition recalled those of the sixth layer. However, I imagined that their structure was less firm, for neither were their prolongations as developed, nor did they fix carmine as well.

Therefore, bearing in mind the fact shown by these sections, which very probably belonged to the most posterior part of the third layer, it is seen that the histological development of the gray substance of the second frontal convolution accompanies that of the internal frontal convolutions, and consequently it is later than that of the paracentral convolution.

(*c*) I now describe the structure of the cornu Ammonis in the newly-born. The sections were made nearly in the middle third. The nerve-cells of the granular layer, which, in the adult, so readily fix carmine, have here fixed but a small quantity, whence it happens that the wavy line which ma-

croscopically reveals this layer is far from possessing the dark tint which later gives it its special feature.

In the convoluted layer one notices pyramidal cells which are perfectly distinguishable from the neighboring tissue by the considerable amount of carmine-staining; but there are still others, a small number perhaps, which are distinguished by their nearly complete indifference to this substance—they are almost white. These latter have at this time the prolongation from the summit, of the same color and well developed, for they are two or three times the height of the cell. In the centre of some, one sees a sphere of protoplasm slightly colored, and which, in some cases, seems to send out a little expansion, a diverticulum, in the direction of the prolongation.

In these two granular layers and this convolution I have most clearly seen the contrast between the structure of the cornu Ammonis in the newly-born and in the adult. But it presents itself so unmistakably, that if it were permitted to attach any importance to the facts observed in a small number of preparations, I would refuse to endorse the assertion of Professor Betz: "The convolution of Ammon (cornu Ammonis) in the newly-born is already formed, having all its characteristics; the cells are as distinctly visible as in the adult." [1]

[1] Revue d' Anthropologie, No. 3—Juillet, 1881.

THE EFFICACY OF IODIDE OF POTASSIUM IN NON-SYPHILITIC ORGANIC DISEASES OF THE CENTRAL NERVOUS SYSTEM.*

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I INTEND this paper to be inquiring and suggestive rather than didactic, and hope that it may be the means of eliciting the experience and opinion of others whose opportunity for observation has been greater than my own.

There has appeared to be in the minds of those members of our profession whom I have had the pleasure of knowing, a half-avowed belief in the *specific* action of potassium iodide; that it is a sort of reagent with respect to syphilis. Many go so far as to assume this position: that if an individual present a given symptom, but denies having had syphilis in any form, and if that symptom disappear under the use of the iodide of potassium, then the symptom must have been syphilitic in spite of the patient's denial. I have repeatedly heard medical teachers say of a symptom: "Give iodide, and we will see if it is syphilitic or not," the implication being that if non-syphilitic the symptom would not be removed by the drug.

The consequences of such a belief may be serious. On the one hand, a physician holding the above views will be

* Read before the New York Neurological Society, Jan. 3, 1882.

indisposed to try the drug in full doses in cases of organic cerebral disease where there is no indication of syphilis; a negative position which might cost the lives of several patients in the course of the physician's life.[1]

On the other hand, after curing certain symptoms with iodide of potassium in a person who claims never to have had syphilis, the physician becomes convinced that the patient has consciously or unconsciously deceived him; that he is syphilitic. Such a view will powerfully influence the physician in his further relations with the same patient as regards his interpretation and treatment of other affections which may show themselves, and in respect to the advice to be given as to marriage, child-bearing, etc.

A more physiological view of the action of remedies upon organic diseases and a careful examination of clinical evidence would, it seems to me, prevent one from assuming the specific action of iodide of potassium in syphilis.

As regards the general question, that of the specific action of remedies, I have not the time to present an argument to show its fallacy; and probably I could not do the matter justice. The belief in the specific action of drugs, *i. e.*, of the action of drugs against disease as such, is a comfortable belief to have; it apparently solves many of the problems of every-day medical practice. But many believe such a doctrine to be just as fallacious and unscientific as it is comfortable. I wholly agree with those who think this, and who believe that remedies act on the organism as a whole, or on its apparatuses, or on some of its tissues, or on its constituent chemical ingredients, in a *physiological* way, *i. e.*, by and through the operation of chemical and physiological laws already operative in the animal body.

In the second place, as to clinical evidence. This is the purpose of my paper; to place before you some cases which

[1] For the opinion of various authors on these points see the end of the article.

I think support the proposition that the iodide of potassium is efficacious, more or less, in non-syphilitic nervous diseases. In going through my case-books for the purpose of finding such illustrative cases, I have exercised great strictness, and as a result I have had but very few histories to read, and these I have condensed as much as possible.

My cases are nine in number, arranged in two groups.

In the first group are three cases of organic disease of the brain, in which many threatening symptoms were relieved, in some of them immediately and on different occasions, by the free use of the iodide. In all these cases postmortem examinations were made, and the gross lesion found. In all of these there was no clinical or histological evidence of syphilis.

In the second group are six cases which are still living, some cured. I divide this group into two classes, *a* and *b*. The former is made up of three cases of organic cerebral disease in the adult, two of them cured, and the third twice relieved of most of his symptoms by the iodide. Class *b* is composed of three cases of basal meninigitis with optic neuritis in litttle children, who recovered rapidly while using the same remedy. I attach much less importance to these infantile cases, because of the doubt there must remain as to their having been any thing more than optic neuritis. Still they have a certain value in a purely clinical paper like this one.

FIRST GROUP.

CASE I.—*Tumor of left crus cerebri.* G. W., æt. nine years. Seen 21st September, 1874. Had been a healthy boy. Parents and other children healthy.

In the month of April had measles without head-symptoms. Early in May awkwardness of right side of body ; gradually extending paresis from arm to leg ; face unaffected. In August he walked like an old man, with his right shoulder drooping, right arm almost motionless. Speech normal. During July and August

had a great deal of occipital headache, relieved by cold. Since August, pain in various parts of head ; more in front and behind. Of late the pain has been sharp, occurring in paroxysms, and accompanied by nausea and vomiting. Irregular jerking movements of the paralyzed side first noted in August ; none in the face. In the last ten days as above, but weaker ; able to walk a little alone. Four weeks ago double vision, and since a squint ; parents think vision is otherwise normal. The pulse has been observed by the family physician, Dr. Banks, to be habitually very slow, about 60, and at times irregular. Has had no convulsions or loss of consciousness. No recent injury to head, and never disease of the ear. Paroxysms of headache and vomiting often occur in the middle of the night.

On examination I found patient conscious, with right-sided hemiplegia ; lower face affected. There was also palsy of the left sixth cranial nerve, producing convergent strabismus and diplopia. Slight rigidity in fingers of right hand. When patient attempts voluntary movements there is well-marked ataxia of the right upper extremity. No anæsthesia. Pupils normal. Vision impaired in left eye. Ophthalmoscope shows choked disks. On attempting to walk staggers very much. Complains of vertigo. Left side of body normal.

I advised the application of blisters behind the ears, and internally a saturated solution of iodide of potassium. On October 2d, patient being weaker, he, after vomiting in the morning, rather suddenly passed into coma. No convulsions. After forty hours regained consciousness with more paralysis on the right side, the same ataxia, and nearly complete loss of vision. Paroxysms of pain and vomiting never returned after this.

On October 4th, improvement began in right side and continued. Mind clear.

On October 11th is taking ten drops of the iodide solution three times a day ; can move right leg.

October 20th, takes eighteen drops three times a day ; more strength in arm and leg.

November 17th, takes forty-five drops three times a day ; can raise himself up in bed. November 21st, taking sixty drops thrice a day ; walks with some help.

Until December 8th this maximum dose of sixty drops was continued ; after that date it was gradually reduced to forty drops on the 13th. Constant gain.

I saw G. on December 14th. He then walked about alone with

a half-ataxic, half-choreic action of the right side. He presented a partial right hemiplegia, face and body, and complete palsy of the left sixth nerve. No anæsthesia. The optic nerves showed commencing white atrophy ; no perception of light. No muscular atrophy. No headache.

My friend, Dr. J. C. Shaw of Brooklyn, then took immediate charge of the case, though I saw it occasionally with him the first year. Iodide omitted in winter.

In 1875, from early in April to end of May, severe symptoms—headache, vomiting, cramps in calves of legs, and priapism—were relieved by the iodide increased slowly from gr. x to gr. xxxv three times a day. After having been in bed for weeks, is again able to walk about with some right hemiparesis and hemichorea.

Dr. Shaw saw patient rarely after that until the spring of 1880, when after a series of anomalous symptoms he died. The autopsy made by Dr. Shaw revealed complete compression of the left crus cerebri and pressure on adjacent parts of the pons and cerebrum by a large irregular tumor.

The microscope showed it to be chiefly a sarcomatous growth with here and there large cells, either mother cells or modified ganglion cells.

CASE 2.—*Cerebellar tumor—internal hydrocephalus.* Paul K., aged eight years. Seen in consultation with Dr. Malcolm McLean of Harlem, on Nov. 17, 1879.

In the past eight or nine months has suffered from diffused headache, attacks of vomiting, double exophthalmus, and staggering gait. Has been seen by many physicians, most of whom attributed the symptoms to "malaria." Child grew steadily worse in spite of treatment on this theory, and in August was taken to the Catskill Mountains. While there seemed worse ; headache severe ; staggered and vomited ; was very weak. In September came under Dr. McLean's care, with above symptoms ; no paralysis or impairment of intelligence. Parents stated that there have been no epileptiform seizures and no fever. Small doses of iodide of potassium caused improvement. Treatment suspended in October.

In last two or three weeks again worse ; severe headache, much of it occipital and frontal. Great enlargement of the head and separation of sutures. Marked exophthalmus—staggering gait and pseudo-paraplegia. A few days ago there occurred sudden recession of the exophthalmus, and simultaneously there appeared a soft, fluctuating tumor or swelling in the right occipital region.

There is no history of injury to the head, or of causes of tuberculosis.

Examination.—Child pale but intelligent: speech normal; vision seems good by finger and color tests, but the ophthalmoscope shows double neuro-retinitis (choked disk) of moderate degree. No facial or head-paralysis. Coördinates perfectly well. All the cranial sutures are wide open; anterior fontanelle closed; forehead not very prominent; no exophthalmus now. In the right occipital region, in the vicinity of the lambdoid suture, is a soft, compressible subcutaneous tumor, walnut size, whose contents beat synchronously with the pulse. The appearance of this swelling caused a relief to all symptoms except debility. It might be supposed that this swelling contained fluid derived from the hydrocephalus, but from its location I felt considerable doubt as to this.

Patient walked feebly in a staggering way; no paralysis or ataxia.

I made the diagnosis of internal cerebral hydrocephalus, probably from tumor of the cerebellum comprising aqueduct of Sylvius. I advised against puncture and aspiration of the newly-formed sac, and recommended larger doses of potassium iodide.

Dr. McLean kindly wrote me Dec. 30th of this year:

"We immediately increased the iodide of potassium from ordinary doses (5 to 10 grains) of from 25 to 40 grains; so that he received amounts of the medicine varying from 90 to 150 grains per day. The medicine never disturbed his stomach, and his symptoms were certainly ameliorated by the larger doses, which were continued for four months without interruption. The pains in the head were undoubtedly controlled by the medicine."

The child died in the early spring of 1880, and an autopsy by Dr. McLean showed a cerebellar tumor compressing the aquæductus Sylvii and the venæ Galeni, thus causing ventricular dropsy. Tumor was fibro-sarcoma.

It was well that the externally presenting sac was not punctured, for it turned out to be the extruded lateral sinus.

CASE 3.—*Tumor of the cerebellum.* J. J., aged fourteen years. Seen first on July 29, 1880. Had been a healthy boy. At three years had whooping-cough severely with several convulsions. Parents deny convulsions or petit-mal since.

About January 1, 1876, J. fell heavily on a stone walk, striking

his head so hard as to make him unconscious; did not vomit. In April of that year he began to have curious vomiting spells in the early morning, followed by violent occipital headache. The patient describes the vomiting as not preceded by nausea, and the rejected matters contained no food. After having had these attacks for several days, one afternoon J. fell unconscious and had a general convulsion, repeated in the night. After this J. carried his head inclined to the left shoulder, his occipital headache continued, and he had a stiffish feeling in the neck. The vomiting did not return, and there was no delirium.

At the end of May he had gradually become paralyzed generally, but more on the left side. He had pain in his eyes with rapid failure of sight. Drs. Agnew and Knapp found white atrophy of the optic nerves. No recovery of sight since. (It is very probable that during April there had been choked disks, with fairly preserved vision.) Speech was never affected.

Spontaneous improvement occurred, and in July, J. was able to sit up, and gained rapidly in all respects except sight. Some disability in use of hands and walking remained. He grew well, and was taught at the school for the blind. Has been very intelligent. No special symptoms occurred for nearly four years, viz: until May of this year (1880) when he began to have attacks of occipital pain and vomiting; occasionally had pain in left mastoid region, and numbness in left side of chin, and around left corner of mouth. A few days ago was found unconscious; probably had had a convulsion. Admits occasional dizzy or unconscious spells of momentary duration. Is still able to be up all day, dressed.

Examination (July 29th).—Eyes in left conjugate deviation; sightless; pupils wide; nerves bluish-white. Tongue straight; right hand 20°; left 25°. Left leg stronger than right. Consequently has right hemiparesis; no tendon reflex at knees; walk is staggering, more off toward his left. There is no distinct ataxia, and the walk is not of the type called cerebellar; no anæsthesia. I gave him a mixture of bromide and iodide of potassium, of each salt about 1. at night, quinine, sherry-wine, and food.

Sept. 29th.—Patient improved wonderfully in first month of above treatment. Early in September had a sort of convulsion, and since more or less occipital pain; objective symptoms as above.

Nov. 14th.—Poorly of late. Occasional attacks of occipital pain and vomiting (without nausea); rather frequent attacks of petit-mal, or perhaps more strictly speaking syncopal attacks, usually

associated with headache. In last twenty-four hours has been semi-comatose, at times vomiting. Pulse weak. Ordered ext. digit. fld., .06 and tr. opii 18, by mouth.

Nov. 16th.—To-day better, and is ordered ten drops of a saturated solution (equal parts) of iodide of potassium three times a day, to be increased each day by two drops at a dose. The small dose of bromide heretofore given (about 1.) stopped.

Dec. 6th.—The iodide has been gradually increased to forty drops three times a day, with the best results: no headache or vomiting or syncope since beginning iodide. No bromide. Rich food and sherry.

Examination shows a new symptom, viz., occasional twitching and distinct ataxia of the right upper extremity; none in the legs; perhaps a trace of ataxia in left hand. Absolutely no tendon reflex at knees. Right hemiparesis; no anæsthesia; face not paralyzed. Is up all day, and walks out-of-doors occasionally. Iodide to be gradually reduced.

Several times during the winter and spring of 1881, J. had a return of occipital pain and syncopal attacks; more recently of cervical pain also. These attacks were invariably cut short by blistering the nape of the neck or the mastoids, and by giving at once the full doses of K I, viz., from forty to fifty drops three times a day. Previous to Dec. 21st, the blisters had not been used, so that we may conclude that the more potent agent, in affording relief to the very distressing and threatening symptoms was the iodide of potassium. The relief usually appeared in two or three days. Between the exacerbations the dose of iodide was from ten to twenty drops, and he had a variety of tonics.

The summer of 1881 was exceptionably favorable for J. He was very well and happy. Though blind and slightly ataxic he enjoyed life, and was very cheerful. He had learned to do many delicate manipulations with his hands.

Oct. 12th.—J. was seized with convulsions, vomiting, and a gradually increasing pyrexia. Died comatose on 14th at midnight, with axillary temperature of 103°.

Autopsy showed a tumor involving a large part of the inferior portion of the right hemisphere of the cerebellum, forcibly compressing the underlying portion of the mesocephale. The upper three fourths of the same right hemisphere of the cerebellum was occupied by a cyst containing a clear fluid. The bottom of this cyst is the solid tumor referred to above. The cyst has disintegrated the upper and middle portions of the vermis superior.

The cerebral convexity showed abundant heavy patches of purulent sub-arachnoid meningitis, chiefly along vessels. The microscope showed in fresh serum preparations tubercle-like masses round about vessels, and at their bifurcation. This meningitis was the cause of death.

A microscopic examination of the solid cerebellar tumor showed the sub-cystic tumor to be mainly sarcomatous, cellular and vascular, with foci of amyloid degeneration.

The family are all unusually healthy. Besides J. there are seven living children who are pictures of health. The father and mother are perfectly well, and always have been. The teeth of patient were normal, and he was a well-developed lad of rather hydrocephalic aspect. No suspicion of specific disease could be entertained in this case.

SECOND GROUP, CLASS A.

CASE I.—*Left hemi-paræsthesia cured by potassium iodide.* Dr. J. K., U. S. A., æt. forty-five years, seen December 8, 1877. Had always enjoyed good health. While on duty in a Western State, December 13, 1874, had a sudden attack of left hemi-numbness—face and body. There was only very slight loss of motive power, if any. The sensation, which for a long time was intense, was a mixture of hyperæsthesia and numbness. Special senses unaffected. The paræsthesia has diminished in extent and intensity, but is still constantly present in the ulnar side of the left hand and outer side of left leg ; occasionally in left cheek.

Examination shows no actual paralysis, though there is awkwardness of the numb parts. There is no true anæsthesia, and neither ataxia nor chorea. The heart is large and beats heavily ; no murmur (?) Has had several angina-like attacks. Patient adds, that when first attacked in 1874, his left external rectus was paralyzed for two weeks. There is well-marked dementia, slowness of intellect, and loss of memory. Patient has failed in his examination for promotion in spite of hard work.

Habits always good ; positively and repeatedly denies syphilitic infection, or any symptoms. Notwithstanding my faith in the doctor's denial, I gave him iodide of potassium freely, and in a few weeks all the paræsthesia disappeared. Subsequently the case developed into one of dementia paralytica, with occasional epileptiform and apoplectiform attacks. He still lives in a subjectively happy imbecile state.

I regret that the notes of the case contain no record of the doses of iodide employed. The relief was striking however.

CASE 2.—*Paralysis of third cerebral nerves*; *paresis and ataxia of limbs; relief in two attacks by iodide of potassium.* W. R. B., æt. twenty-nine years. Ref. by Dr. Agnew, July 16, 1878.

Former health poor. Tobacco and beer used to excess; intense dyspepsia, with cardiac disorder and abdominal paræsthesia; catarrh of bladder; impaired memory. Positively denies syphilis.

July 2d.—While camping in the woods, awoke with paresis of left third nerve (ptosis and diplopia), which rapidly became complete paralysis. No other symptoms. Galvanism and iodide were employed, and strychnia hypodermically.

July 20th.—In last two to three days a numbish feeling began in feet and has extended to middle of the thighs; legs weak; aching pains from sacrun to feet. At times finger tips are also numb. No vesical weakness. No pateller tendon reflex. Was ordered Squibb's fluid extract of ergot, dry cups to spinal region, and rest in bed. Optic nerves normal.

About the beginning of August the right third nerve also became paretic, and then paralytic symptoms in legs and arms were the same; they were all signs indicating a lesion involving the crura cerebri. Ergot was continued, and iodide of potassium added to the treatment.

August 27th.—Very much improved; walks quite well; arms seem weak to patient but he can squeeze 59° with right and 53° with left hand. Both third nerves better; images nearer together; less dizziness. Has been taking more iodide and less ergot of late. Uses galvanic current to hands and eyes. Ordered: cease ergot and increase iodide from present dose of forty-five to sixty drops three times a day.

31st.—Improving. Right internal rectus nearly normal; can open left eye better. At times a trifle of numbness in outer part of feet. In spite of sixty drops of solution of iodide three times a day his digestion is better than for a long time. To continue iodide, and to take 4. of dialyzed iron at bedtime.

September 7th.—Right eye moves normally; left nearly well; internus and levator palpebræ are weak. Ordered: Continue sixty drops of the solution of the iodide *t. i. d.* [also other remedies for nervousness].

12th.—Goes to the country nearly well; left third nerve still paretic. Iodide to be decreased by two drops each day. Galvanic application to be kept up to the eye. Takes also quinine, iron, digitalis.

23d.—Advised by letter to resume sixty drops of solution of the iodide.

December 11th.—Patient was *in statu quo;* free from paralytic symptoms except in distribution of left third nerve. Is now taking thirty drops three times a day. Also bichloride of mercury .004 in elixir of calisaya, three times a day.

During the spring and summer of 1879, the left third nerve varied in its condition, and the dosage of iodide was varied accordingly, ranging from twenty to sixty drops *t. i. d.* He had it most of the time, and it never produced any disagreeable effect. There was no return of paretic symptoms in the limbs.

Nov. 7, 1879, Mr. B. again came under observation. The left eye was as before, and he had some new symptoms. Slight numbness in the deep and superficial branches of the left trigeminus (including tongue). Two or three weeks ago the legs were weak, and an approach to numbness was observed in the thighs.

Examination showed paresis of left third nerve ; when right eye is kept closed, and a strong effort of the will made, the left lid can be raised, and even the internus contracts (slow conduction in nerve). In accommodation with convergence the left pupil contracts like the right. Left facial muscles are perhaps weak ; the æsthesiometer shows some anæsthesia in distribution of the left trigeminus ; pricking is well felt. Tongue projects straight. Hands not anæsthetic or numb ; grasp, R., 69° and 64° ; L., 57° and 56.° Knee reflex entirely absent. Stands well with eyes closed. Sexual debility ; optic nerves normal ; denies fulgurating pains, and again denies syphilitic infection or symptoms. Last winter his wife was delivered of a very healthy baby. Ordered : Increase iodide solution from present dose of thirty drops *t. i. d.* by 5 drops each day, to 120 drops *t. i. d.*, then to decrease. Also ordered phosphide of zinc, .006 ; ext. nucis vomicæ, .02 ; quiniæ sulph., .10 in a pill *t. i. d.* Goes home to Central New York.

Oct. 2, 1880. Returns to New York. Mr. B. carried out the above treatment faithfully for a long time, and was entirely relieved of all symptoms, except sluggishness of the left third nerve. He remained fairly well until June of this year. Then, after resuming the free use of beer and tobacco (denied sexual excess), he noticed awkwardness and numbness of the hands, staggering in walking, and legs seemed weak. No change in left eye. Return this autumn of numbness in left spura-orbital region. No headache.

Examination showed a titubating and coarsely ataxic walk ;

staggering when standing with eyes closed; no patellar reflex; marked anæsthesia and ataxia of both hands, especially of right. Left eye as described above (imperfect and slow conduction in third nerve). Pupils active; optic nerves normal. The ataxia of hands in test with closed eyes is typical. Slight anæsthesia of left forehead.

The patient remained under treatment until April, 1881, when he went home without improvement; really more ataxic and anæsthetic in hands and feet.

Throughout the long duration of the case, there was no headache (only paræsthesia at vertex when anæmic in first winter of treatment), and the optic nerves have escaped injury. All the symptoms point to disease of the left crus cerebri, extending over toward the right, and the case bears a certain resemblance to cases 1 and 3 of the first group, in which tumors were found, except that the patients had blindness from disease of the optic nerve.

I should add that in the last visit of the patient to town, from October, 1880, to April, 1881, persevering attempts at treatment were made. He had the iodide solution carried up to 175 drops three times a day; bichloride of mercury in moderate doses; strychina; the actual cautery behind ears and down the spine; and galvanism. The disease made slow but sure progress all the time. Yet, twice before, in 1878 and in 1879, the iodide had, in the most evident manner, removed all symptoms except the paresis of the third nerve on the left side.

My friend, Dr. Charles McBurney, who is known to many of you, had been well acquainted with Mr. B., and was disposed to place reliance in his denial of syphilis.

CASE 3.—*Right hemi-epilepsy and aphasia cured by iodide of potassium.* Mr. J. L. C., æt. twenty-four (?) was seen Sept. 30, 1879. This gentleman was brought from Newport by Dr. George Engs, and was placed under my care by his family. When I first saw him he was conscious, but suffering from frequently repeated epileptiform attacks in the right face. From a variety of sources the following history of the case was gradually obtained. Patient is a large, well-developed young man who has always enjoyed good health. For more than a year Mr. C. has worried about some secret trouble, and has become dull, complained of insomnia, has lost his interest in reading and in music, of which he was very fond. Last winter he contracted a severe bronchitis, which has very slowly passed away. No injury to head; positively denies syphilis, and bears no sign of it.

About the last of August he came in one day from the beach at Newport, and said he had had a sunstroke. No one was with him at the time, so that the nature of the attack remains a mystery. It could hardly have been a sunstroke, as there were no others in Newport that day, and the heat was not excessive Judged by the light of subsequent events, it must have been a first epileptiform attack.

Soon thereafter Mr C. went to Lenox, Mass., and led an active social life, dancing, playing lawn tennis, etc. Complained of headache on the way to Lenox, and while there. While there had three or more epileptiform seizures, varying from a "faint" to an attack in which the right arm was stiff and unmanageable. This decided spasm, witnessed by an intelligent layman, occurred about Sept. 15th. The next day he went alone to Boston, turned up at a friend's club greatly confused, asking who he was, and writing his name on a card for use in case of trouble ; came to Newport in a couple of days, and was there under Dr. Engs' observation. When seen on Sept. —, was confused ; used wrong words, or rather had to struggle to find or enunciate the right word (aphasia).

On Sept. 23d, in Dr. Engs' presence, after struggling to find a word, he was seized with a full epileptic fit, probably stronger on right side. He bit his tongue slightly. Pulse slow ; no fever ; no albumen in the urine. Sept. 24th, epileptic attack in evening. Dr. S. Weir Mitchell saw patient ; found optic nerves normal and would make no diagnosis. Was given bromide of potassium in doses of 20 grains, frequently repeated. On 25th, had three or four attacks, chiefly affecting right face, arm, and leg. Since he has had innumerable partial attacks every day, affecting the right face and arm ; not always with loss of consciousness. For example on Sept. 28th, he had at least twenty-five seizures ; more frequent in last forty-eight hours. In the last day or two the spasm has tended to restrict itself to the face on right side, and has not been accompanied by insensibility. During the week there has been progressive abolition of speech ; now says but two or three words. Has had from 8. to 10. of bromide of potassium daily in last three to four days.

Description of facial hemi-spasm as observed frequently on Sept. 30th and on Oct. 1st : "First there is a tonic spasm of superficial muscles, especially the buccinator and levator anguli oris ; the mouth is strongly drawn to right ; eyes closed ; at same time jaws are motionless, sometimes closed, sometimes opened about thirty mm. In a few seconds clonic movements appear in super-

ficial facial muscles, a few chewing movements are made, and a stream of saliva flows, partly caught upon a cloth held by patient, who is perfectly conscious. Some saliva runs back into the larynx and causes cough. Pupils remain normal. A few times the cervical muscles on right side seemed stiffened. Tongue not bitten, but a right canine tooth has caused ulceration of inside of lip." These attacks were the residua of the previous hemi-spasms, and of the still older general spasm. They presented all the characters of the Jacksonian or motorial epilepsy, which is so certain an indication of a gross local cerebral lesion.

Oct. 1st.—In the night Mr. C. had from thirty to forty attacks of mixed facial and trigeminal spasms on the right side. Arose, and turned down the gas, saying distinctly, "Down, down." Liquid food causes strangling and coughing. Has gone to water-closet himself; axillary temperature normal, and pulse 90. Last evening was cupped behind ears, and had chloral besides bromide: .30 of chloral and 1.20 of bromide every four hours. At noon said "beef tea"; looks dull and sleepy, great drawling, tongue protrudes to the right; toward evening fewer spasms; pronounces his name on demand; mind clear; small blisters behind each ear; no evident paralysis of face, arm, or leg, but aphasia and agraphia are practically complete. Patient has the vacant, helpless, impatient look of aphasics when asked a question. Pulse 100.

Oct. 2d.—Very much better. Slept a great deal, and had few spasms in face last night; drinks more easily; sits naturally on lounge and shakes hands; with slowness says about a dozen words; no headache; recalls names of Drs. Engs and Mitchell. For the first time in forty-eight hours no spasm occurs during my visit; axillary temperature 97.5; pulse 102. Less drawling; tongue still goes to right; order 20 drops of a saturated solution of iodide of potassium, .30 of chloral, and 3. of bromide at one dose, three times a day. The optic nerves were examined in the first few days of the treatment and afterward, but found healthy.

It is unnecessary to continue a journal of this case. The above mixture was continued for several weeks, the bromide being reduced to 2. and the iodide increased to 80 drops, three times a day. After October 17th no chloral was given. The iodide was further increased, a maximum being reached on Oct. 26th, when 120 drops were given, with 2. of bromide three times a day.

Not many days later the bromide was omitted and the iodide given with a tonic in doses ranging from 100 to 50 drops three times a day.

At no time did the iodide produce any unpleasant effects. Toward the end of October some bromism appeared.

The improvement was steady in all these four weeks; the local spasms became fewer, and ceased before the end of the month. Speech steadily increased, and toward the end of the month writing was begun.

Mr. C. came to see me about getting married last winter. I again questioned him about syphilis, and he gave me his word of honor that he had never had a venereal sore or a suspicious symptom.

He has remained perfectly well.

SECOND GROUP, CLASS B.

Cases of double optic neuritis, probably due to basal meningitis, in children; apparent good results from large doses of iodide of potassium.[1]

Case I.—A little girl, aged six years, was brought to my class at the Manhattan Hospital, a couple of weeks ago, with the following simple history. For two or three weeks she had complained of headache, had vomited frequently, and on February 9th (a week ago) internal strabismus appeared. The patient has not complained of impairment of vision; she has not had fever, spasm, or delirium. Constipation has, however, been marked. She is anæmic-looking; a small brother of hers probably has phthisis, and one child of the same parents is said to have died of "brain fever." My assistant at the Manhattan Hospital, Dr. Adam, immediately examined the child's eyes with the ophthalmoscope, and found double neuro-retinitis: a diagnosis which I concurred in, and which was verified by Dr. Webster in the Ophthalmic Department of the hospital. Consequently, the most important symptom was the one revealed to us by the use of the ophthalmoscope. I made the diagnosis of basal meningitis localized about the chiasm of the optic nerves, probably without tubercular deposit. The child was blistered behind the ears, and given .60 of potassium iodide, three times a day, with instruction to increase the dose by .30 per dose, every second day.

The child now does not seem sick, and were it not for the convergent squint, one would probably consider her as only a delicate

[1] From a clinical lecture delivered at the College of Physicians and Surgeons, New York, Saturday, February 23, 1878.

anæmic child. In the last few days, the headache and vomiting have ceased, and improvement has begun.

Case 2.—Referred for examination to Prof. H. Knapp, on May 2, 1877, a girl, aged four years, previously healthy. First symptoms noticed about five weeks before examination, consisting chiefly in dulness, irritability, slight headache, and, on one occasion only, vomiting. Two weeks later internal strabismus (one eye) suddenly set in, and has persisted. No fever, spasm, or delirium. Previous to this attack there had been no emaciation, or cough, or ill-health of any kind. Dr. Knapp found double neuro-retinitis, with paresis of external rectus of one eye. On examination, I found the child with the above optic symptoms, and very cross; the buccal temperature was 99° F., and the pulse 96, perfectly regular. I made the diagnosis of non-tubercular localized basal meningitis, and expressed the opinion that the child's life was in no danger, though vision might remain considerably impaired. Dr. Knapp was giving potassium iodide, which I also advised. A few days ago Dr. Knapp informed me that a few weeks after I saw the child the strabismus disappeared, and that the neuro-retinitis gradually gave place to atrophy of the optic nerves, which, fortunately, was but slight, so that vision is now nearly perfect.

Case 3.—A little girl aged five years was sent to me for examination by Prof. C. R. Agnew, Feb. 14, 1878. I learned that the child had passed through an attack of chicken-pox early in January, without fever or apparent ill-health. About January 19th, the left eye "turned in," and strabismus has been constantly present since. No other symptoms have been observed—no fever, headache, irritability, etc. The mother states that one of her former children, at the age of eleven months, had convulsions and fever, became unconscious, and died in two weeks.

Examination of the eyes by Dr. Agnew reveals "double optic neuritis, with some stuffing of the disks; hypermetropia, one seventh, of the disk."

I made the same diagnosis as in the case sent me by Dr. Knapp (case 2); viz., local basal meningitis of a non-tubercular nature. I advised blisters behind the ears, and large doses of potassium iodide. The case did very well.

I submit this contribution, well aware of several objections to the thesis it supports.

It may be said that the improvement observed was the

result of the so-called *vis medicatrix naturæ*, a spontaneous improvement. This might more especially be said with reference to the cases of infantile basal meningitis and optic neuritis. Case 1 of the first group is likewise open to this objection, but in the other cases it is different. In case 2 relief was twice obtained in an evident manner from the iodide; in case 3 threatening symptoms repeatedly passed away within a few hours after giving full doses of the drug.

The first class of the second group is more demonstrative of the curative powers of the iodide. In case 1 we see a hemiparæsthesia of three years' standing disappearing in a few weeks; in case 2 symptoms quite positively indicative of organic disease of the crura cerebri twice relieved (all but slight weakness of the third cerebral nerve) by the iodide; and in case 3 the symptom-group which we often call Jacksonian hemi-epilepsy, with aphasia, was completely and permanently cured. My experience with these hemi-symptoms is that they nearly always indicate a tumor in the brain, and I have seldom seen them cured.

To the cured cases it may be objected that the patients consciously or unconsciously deceived me as to the existence of syphilis. It so happens that the subjects of the class just referred to were men who by their temperament and their relations to me would have been very unlikely to deceive, and they all three were told how essential it was to a proper treatment of the case that they should tell the exact truth.

But there are other tests, besides a belief in the truthfulness of the patients. They bore no external evidences of syphilis in the shape of scars or enlarged glands. Case 2 demonstrated the non-syphilitic nature of its lesion by a third relapse with new symptoms utterly resisting the iodide. Case 3 has remained well for two years without treatment.

Case I had symptoms of failing mind when he consulted me, and has since been a good example of paralytic dementia without positively exalted notions. The non-syphilitic nature of this dementia has been shown by its very slow development and by the fact that one or two trials of mercury and iodide of potassium proved unfavorable. Besides, the patient, as a physician and an army man, was the least likely of all to deceive me as to the origin of his trouble.

In my first experience with these cases, I gave the iodide of potassium in medium doses, from thirty to fifty drops of a saturated solution three times a day, but since 1877-8 I have used much larger doses and with no unpleasant results.

It is surprising how well patients of all ages bear doses of from fifty to one hundred and fifty drops of the solution without iodism or gastric catarrh. I give it largely diluted, in from one half to a full tumbler of water, and always on an empty stomach, to diminish the risk of decomposition. In the last two or three years I have adopted a plan which I think further assists immediate absorption of the iodide as such, viz., the use of Vichy instead of common water as a vehicle; or, as a substitute, for poor patients, a solution of bicarbonate of sodium. I might add that in several patients, including one of those referred to in this paper (case 2 of second group), digestion has been improved by the iodide.

Even if the iodide of potassium cannot cure organic diseases of the brain, it seems to relieve symptoms. If by the free use of such a remedy, one not directly harmful, we can diminish intra-cranial tension, remove œdema, or perhaps check the growth of some neoplasm, thereby relieving pain and other distressing symptoms, would not this be a gain to our therapeutics?

IDEAS OF DIFFERENT AUTHORS BEARING ON THE SUBJECT OF THE FOREGOING PAPER.

BARTHOLOW, R., A Practical Treatise on Materia Medica and Therapeutics, 3d edition, 1880, p. 191, says: "But few affections of the brain, non-specific in origin, are benefited by the iodides.

BARTHOLOW, R., A Treatise on the Practice of Medicine for the Use of Students and Practitioners, 3d edition, 1882, p. 568, in speaking of the treatment of intra-cranial tumors, says: "There are two remedies which ought always to be used—iodide of potassium and ergot; for although only syphilitic and possibly aneurysmal tumors are remediable, the case under treatment may be one of them."

EDES, ROBERT T., Therapeutic Hand-book of the United States Pharmacopœia, etc., 1883, p. 255, says: "The curability of any disease by iodide of potassium, however, does not warrant a diagnosis of syphilis." Page 256: "It should be given freely in all cases of cerebral tumors, and often in meningitis."

FLINT, AUSTIN, A Treatise on the Principles and Practice of Medicine, etc., 5th edition, 1881, p. 726, when speaking of the treatment of tumors within the cranium, says: "It is, however, claimed, that certain remedies, namely, the iodide of potassium, the bichloride of mercury, and arsenic, do have such an influence in such cases," (meaning non-syphilitic growths.)

HAMILTON, ALLAN MCLANE, Nervous Diseases; their Description and Treatment, 1878, p. 202, under the treatment of brain tumors, says: "It has been my practice in every case to place the patient upon an anti-syphilitic course of treatment."

HAMMOND, WILLIAM A., A Treatise on the Diseases of the Nervous System, 7th edition, 1881, p. 324, under the head of treatment of tumors of the brain, says: "So far, however, as other [1] tumors of the brain are concerned, there is no treatment calculated to cure the patient, unless a syphilitic taint can be ascertained to exist. It is well, however, even when there are no positive indications of the presence of such a diathesis, to act upon the presumption that it does exist, and to administer mercury in some form with the iodide of potassium."

OBERNIER, F., in Ziemssen's Cyclopædia of the Practice of Medicine, vol. xii, Diseases of the Brain and its Membranes, when giving the treatment of tumors of the brain and its membranes, p. 288, says: "A trial of it [2] should not be neglected."

ROSS, JAMES, A Treatise on the Diseases of the Nervous System, 1881, vol. ii, p. 567, when giving the treatment of focal diseases of the brain, says: "With the view of promoting absorption of the morbid growth, iodide of potassium has been administered in large doses and with apparent benefit."

STILLÉ and MAISCH, The National Dispensatory, 2d edition, 1879, p. 1161, under the subject of potassium iodide, say: "In many cases of *paralysis*, due,

[1] Meaning other than aneurysmal.

[2] Meaning iodide of potassium.

probably, to pressure upon a motor centre, or upon a nervous trunk, produced by syphilitic or other swellings, the medicine is often singularly efficient and should never be omitted from the treatment."

WILKS, SAMUEL, Lectures on Diseases of the Nervous System, 1878. p. 461, in general remarks on remedies, says: "In cases of epilepsy and many obscure nervous affections, I usually commence with this class of remedies,[1] knowing that a curable disease has sometimes ended fatally because they have been overlooked." [R. W. A.]

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[1] Meaning iodide of potassium and perchloride of mercury.

ON THE ANATOMY AND PHYSIOLOGY OF THE SMALL MUSCLES OF THE HAND.

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IN a previous number of the ARCHIVES,[1] we have studied the small muscles which occupy, both anteriorly and posteriorly, the middle portion of the hand, *i. e.*, the interossei and lumbricales. In the present paper, our attention will be directed to the consideration of the muscles which are intrinsic to the thumb and little finger. The muscles composing the first group are those which are situated anteriorly, at the upper and outer aspect of the hand; they are by far the more important of the two sets of muscles that remain to be studied, and form, by their agglomeration, the mass known as the thenar eminence.

The second and less important group, situated at the inner aspect of the hand, forms the hypothenar eminence.

To gain a better idea of the action of these muscles, we shall, as in the case of the interossei and lumbricales, glance at their anatomy, pointing out, at the same time, the principal facts requisite for our purpose.

INTRINSIC MUSCLES OF THE THUMB.

Anatomy.—To avoid all source of error, we, with most anatomists, have divided the muscles of this group into two

[1] ARCHIVES OF MEDICINE, vol. ix, No. 1, New York, Feb., 1883, p. 59, *et seq.*

sets: one external, comprising those muscles which are inserted into the outer aspect of the first metacarpal bone and two phalanges of the thumb; the outer set being formed by one single muscle which is inserted into the inner border of the first and second phalanges of the thumb.

The muscles forming the first or outer group of the thenar eminence are three in number, viz., the abductor brevis pollicis, the opponens pollicis, and the flexor brevis pollicis.

ABDUCTOR BREVIS POLLICIS.

This is the most superficially situated of all the muscles of this group; it is thin and flat, somewhat triangular in shape, and arises by tendinous fibres from the ridge of the os trapezium, from the outer part of the lower border of the anterior annular ligament, and very often from a tendinous expansion derived from the abductor longus pollicis. From this origin the muscle takes an oblique direction and runs outward and downward to terminate in a flat tendon, the inner portion of which is attached to the outer aspect of the external sesamoid bone, where it is in intimate connection with the tendon of the flexor brevis pollicis, which is situated immediately underneath, while the external portion of the tendon continues its way downward and backward, meeting the tendon of the extensor longus pollicis, which it accompanies to the base of the last phalanx of the thumb into which they are inserted.

Physiology.—A glance at the writings of the ancient as well as of the modern writers on anatomy will suffice to give us an idea of the diversity of opinion existing between them regarding the action of this small and important muscle.

While some think that "its only use is to pull the thumb from the fingers, and to extend the second bone upon the

first,"[1] others have asserted that it inclines the first phalanx of the thumb toward its external border, at the same time that it flexes it,[2] According to Cruveilhier, this muscle is an *adductor* and not an abductor as it has been thought; for "it brings the thumb forward and inward." Among the authors whose attention has been attracted by the small muscles of the hand, one deserves special mention: we refer to Duchenne (de Boulogne), whose researches in this line are well known to all. This author, relying upon his own anatomical as well as upon his electro-physiological investigations, has denied the view advanced, by which this muscle is made an abductor.

According to him, it performs the opposition of the first metacarpal bone[3] with the extension of the second, and flexion of the first phalanx of the thumb, together with a movement of rotation of this latter phalanx on its longitudinal axis.[4]

Nevertheless, if by a careful dissection this muscle be exposed and freed from all connection with the other surrounding tissues, it becomes comparatively easy to demonstrate that traction, applied directly to its belly, between its origin and insertion, and in a direction corresponding exactly to the longitudinal axis of its fibres, is first followed by a movement forward of the first metacarpal bone and of the first phalanx of the thumb, this being, in turn, followed by a movement of rotation inward, of the first, and of extension of the second phalanx of the thumb on the first.

Besides, we have been able to determine these facts, beyond doubt, by careful and numerous electro-physiological investigations; and if by the use of an induced current, ap-

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[1] John and Charles Bell: "Anatomy and Physiology of the Human Body," 5th American edition, N. Y., 1827, p. 216.

[2] Jamain: "Nouveau traité elementaire d' anatomie," Paris, 1867.

[3] Duchenne (de Boulogne): "Electrisation localisée," 2me edition, Paris, 1861, p. 787.

[4] Duchenne: "Physiologie des mouvements," Paris, 1867, p. 301, *et seq.*

plied directly to this muscle in a healthy state, we cause it to react,—the various movements above described could be studied with little trouble; the electrodes being applied in the proper place, it will be found that the first metacarpal bone and the first phalanx of the thumb are pulled away from the index finger, not outward, toward its dorsal side (which would be *extension*), but directly sideways and forward, toward its radial side (*abduction*); at the same time, the first phalanx is rotated inward on its long axis, and the second one extended backward.

Besides these means of investigation, various pathological conditions of this muscle afford good opportunity to study its actions. For example, we have had the good fortune to observe, for a certain length of time, a few of these cases, which have given us the chance to study the effect, on the thumb, of paralysis of this muscle. Thus, in some cases of plumbism, in which the abductor brevis pollicis is atrophied, while the long extensors of the thumb and the extensor ossis metacarpi pollicis still react with a faradic current, the patients are unable to abduct completely the first metacarpal bone and the first phalanx, or to extend the second phalanx of the thumb; besides, the thumb has a great tendency to rotate outward, and assume the position which it occupies in the attitude called the "main de singe," which circumstance depends more especially on the unopposed action of the abductor longus pollicis. The same incapacity to complete these movements is noticed in cases of injury to both the ulnar and median nerves, and in which the abductor brevis pollicis is particularly implicated. This same condition is also present, and may be studied with advantage in some cases of anterior myelitis, in progressive muscular atrophy, etc., etc., in which the thenar eminence and more particularly the abductor brevis pollicis are affected.

From the preceding, contrary to the views entertained by Duchenne and others, we might make the following deductions.

1. That the abductor brevis pollicis, as implied by its name, is an *abductor*, acting in this manner, and at the same time, on the first metacarpal bone and on the first phalanx of the thumb. 2. That it is a rotator, acting from without inward on the long axis of the thumb. 3. That it is an extensor, acting on the second phalanx of the thumb.

OPPONENS POLLICIS.

Anatomy.—This muscle, somewhat larger and thicker than the abductor brevis pollicis, directly under which it lies, is triangular in shape, and arises, partly by tendinous and partly by muscular fibres, from the palmar surface of the os trapezium and from the external half of the anterior annular ligament, behind the origin of the preceding muscle.

From this origin, muscular fibres radiate downward and outward, winding round the carpo-metacarpal articulation of the thumb, and are inserted into the whole length of the radial border of the first metacarpal bone; the fibres of this muscle which are inserted into the upper half of the bone are shorter and have a more oblique course than those that are inserted into its lower half.

Physiology.—The use of this muscle is to bring the first metacarpal bone forward, and to rotate it inward toward the centre of the palm of the hand; hence it is a great auxiliary to the other muscles of this group in the act of opposing the thumb to the other fingers; its action being specially limited to rotating the first metacarpal bone, through which it influences the movements of the thumb, we, with Duchenne, prefer for it the denomination of *opponens ossis metacarpi pollicis*.

FLEXOR BREVIS POLLICIS.

Anatomy.—This muscle has been variously described by different authors; most commonly, however, it has been arbitrarily circumscribed, and divided into two different and quite distinct portions, the one inserted into the inner, and the other into the outer, sesamoid bone.

Nevertheless, to gain a better idea of its anatomical relations and of its physiological functions, we shall follow Cruveilhier's[1] example, and describe only that portion of the muscle known as the *anterior* or *superficial* head, as forming, by itself, the *flexor brevis pollicis;* the *deeper* or *posterior* portion, representing more properly a part of the *adductor pollicis*, shall be included with it, and described as a single muscle.

According to the limit given to this muscle, we shall describe it as originating, partly by tendinous and partly by muscular fibres, from the palmar fascia, the anterior and inferior border of the anterior annular ligament, and from the os trapezium. From those various points the fleshy fibres converge and unite to form a thick triangular muscle, much larger than the two preceding ones, and, running obliquely from above downward and from within outward, they terminate, near the metacarpo-phalangeal articulation of the thumb, in a thick tendon which is inserted into the external sesamoid bone and into the external third of the base of the first phalanx of the thumb.

Physiology.—The greatest divergence of opinion exists among authors on the action of this important little muscle; most of them considering it as an opponens. Indeed, by consulting their works, we see that John and Charles Bell say that the action of this muscle is the same as that of the opponens[2]; Jamain also maintains that it brings the first meta-

[1] "Traité d' Anatomie descriptive," Paris, 1871, p. 698.

[2] *Loc. cit.*, p. 217.

carpal bone forward and inward, and that it flexes the first phalanx[1]; while Cruveilhier,[2] as well as Sappey,[3] denies that this muscle has any power over the action of flexing the thumb; besides, they assert that it brings the thumb forward and inward by communicating a slight movement of rotation to the first metacarpal bone, on its longitudinal axis; hence, the former of the two last named authors believes this muscle to be an "*opponens*," and consequently an "*adductor*," while for the latter, "it may be considered as the principal agent of opposition." Furthermore, Duchenne, while recognizing the correctness of the views expressed by the above-named authors, adds that this muscle possesses also the power of extending the second over the first phalanx of the thumb; but, although it would have been easy to multiply the conflicting ideas on this subject, we believe that, for our purpose, those already mentioned will suffice to establish a contrast between the foregoing views and the results at which we have arrived by our own physiological investigations.

In considering the subject, we cannot help expressing our surprise at all these contradictory assertions; for it has seemed to us comparatively easy to establish that, besides the rotatory action that this muscle exerts upon the first phalanx of the thumb, from without inward, it is essentially a flexor of the first phalanx of the thumb upon the first metacarpal bone. In dissecting this muscle with care (and here we must not lose sight of the fact that, under the denomination, *flexor brevis pollicis*, we have included only that portion of the muscle generally considered by authors as the *superficial* or *outer* head of the flexor brevis), we may soon satisfy ourselves that it has almost no action whatever upon the first metacarpal bone, and that, on the contrary, its principal use

[1] *Loc. cit.*, p. 287. [2] *Loc. cit.*, p. 699.

[3] "Traité d'anatomie descriptive," 2me édition, Paris, 1869, t. ii, p. 365.

is to flex the first phalanx of the thumb upon its metacarpal bone.

Nevertheless, in studying the physiological action of muscles, we must not forget to take in consideration the greatly unfavorable condition in which we find these muscles and the surrounding tissues *post mortem*. Indeed, these tissues, and more particularly those surrounding the articulations, are in such a state of relaxation, that a finger may be thrown in almost any direction, by pulling indiscriminately on any one of the muscles inserted into it. On the contrary, living muscles in a healthy state always possess a certain tonicity, in virtue of which they constantly act antagonistically to each other. In this way, the relations between the various parts of a joint and the neighboring tissues are kept in a certain definite and necessary physiological condition. This condition enables the healthy muscle, responding to the stimulus of electricity or to that of the will, always to contract in a definite and useful direction. This tonic state is irremediably lost in the cadaver, and while acting mechanically on the dead muscle, we cannot be too careful in trying to avoid confusion. It is for this reason that we have had recourse, as agencies for the correction of the sources of error, more particularly to the electrical stimulus, pathological changes, and to the will that we can exert over our healthy muscles. Nevertheless, regarding the electro-muscular researches, we must admit that, in the particular case, it is generally difficult to obtain reaction of this muscle, without exciting at the same time the contraction of some extraneous muscular fibres, thus rendering it impossible, or at least very difficult, to determine the action of the muscle we have in view. But this is far from being *always* the case, as has been sometimes stated ; for we have been able, in several instances, to localize the excitation in such a way as to have gained good results.

Most of these results, let it be said *en passant*, have been obtained, more particularly, in those cases where, either by disease of or injury to their nerves, or, again, owing to some central trouble, the abductor brevis and the opponens pollicis (opponens ossis metacarpi pollicis) had become much less excitable to the induced current, while the flexor brevis pollicis still reacted readily to the same stimulus. In these cases, the principal movements imparted to the thumb by reaction of the flexor brevis pollicis were, flexion of the first phalanx of the thumb upon its metacarpal bone, and rotation of the same phalanx, on its long axis, from without inward. Furthermore, in these same cases, the patients are unable to bring their first metacarpal bone forward and inward (*opposition*); consequently, opposition of the thumb to the other fingers, especially to the last two, is very imperfect. Again, if in a hand whose muscles forming the thenar group are in a healthy state, the thumb being slightly *abducted*, its first phalanx be forcibly flexed on its metacarpal bone, the second one remaining extended, the *flexor brevis pollicis* could be easily felt hard under the investigating finger; which fact shows beyond doubt that the action of this muscle is required whenever flexion of the first phalanx of the thumb takes place on its metacarpal bone.

If, now, this same phalanx be alternately extended and flexed, the muscle is again felt to relax or contract according as the phalanx is extended or flexed; and yet there is no necessary intervening *adduction* or *opposition* of the first metacarpal bone, that can show that this muscle is an "opponens, and consequently an adductor."

From the preceding facts, it is scarcely necessary to add that, according to its denomination, the *flexor brevis pollicis* is the principal if not the only flexor of the first phalanx of the thumb.

We have seen, indeed, that, 1st, it flexes the first phalanx of the thumb at the same time that, 2d, it rotates it, on its long axis, from without inward ; two very useful, not to say indispensable, movements, in the act of opposing the thumb to the other fingers.

THE ADDUCTOR BREVIS POLLICIS.

Anatomy.—This muscle of itself forms the second division into which the muscles of the thenar eminence have been divided, and is situated on the inner aspect of the thumb, in the interval left between the first and second metacarpal bones, anteriorly.

It is by far the largest, and at the same time the most deeply seated, of all the muscles intrinsic to the thumb. Its shape is regularly triangular, and it arises, partly by tendinous and partly by fleshy fibres, from the trapezium, trapezoid, os magnum, the base of the second and third metacarpal bones (*it is this portion of this muscle that forms the posterior or deep head of the flexor brevis pollicis* of the authors), from the whole length of the anterior surface of the third metacarpal bone, and also from the adjoining interosseous aponeurosis (*adductor pollicis* of the authors). From this extensive origin the fleshy fibres converge and unite into a thick bundle, the outer and uppermost fibres of which take an oblique direction downward and outward, while the lower ones, originating more internally, run quite horizontally outward to near the inner border of the metacarpo-phalangeal articulation of the thumb, where they terminate, together with the first portion of the muscle, in a common tendon, which is inserted into the lateral ligament of that articulation, the whole surface of the internal sesamoid bone, and into the inner third of the anterior surface of the base of the first phalanx of the thumb.

Physiology.—Here we shall repeat once more, what we

have already stated, that under the denomination *adductor brevis pollicis* we include that portion of the muscle which is generally known under the name of *deep* or *internal* head of the flexor brevis pollicis, and the bundle of muscular fibres originating from the anterior surface of the third metacarpal bone, originally known as the adductor brevis pollicis.

All that we know regarding the physiological action of this muscle depends solely upon anatomical investigations. It is easy to understand how difficult, not to say impossible, it is to investigate the electro-muscular reaction of a muscle so unfavorably situated for the purpose: only a very small portion of it (the lowermost) being accessible to the electrodes; the rest, by far the larger and at the same time the most important portion, being concealed by the abductor brevis pollicis on the one hand, and the first lumbricalis on the other.

This unfortunate circumstance leaves the results obtained by the aid of the stimulus of electricity applied to the muscle very uncertain, on account of the contraction excited simultaneously in the surrounding muscles, by the diffusion of the current.

By glancing at the literature on the subject, we see that, according to Cruveilhier, this muscle is essentially an adductor[1]; Sappey also considers it as an adductor, and, besides, this author adds that "in a great many movements it unites its action with that of the opponens and flexor brevis pollicis."[2]

Duchenne, following Cruveilhier's example, has applied the denomination adductor pollicis to both the *deep head of the flexor brevis* and the *adductor* of the authors.[3]

According to him, the use of this muscle is to produce adduction of the thumb, flexion of the first and extension of

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[1] *Loc. cit.*, p. 699. [2] *Loc. cit.*, p. 368. [3] "Electrisation localisée," p. 790.

the second phalanx of the thumb, and lastly a movement of rotation of the thumb on its longitudinal axis.[1]

In our mind, however, relying upon the results obtained by us, this muscle performs adduction of the thumb toward the long axis of the hand—this being its principal use; we have to note that it also flexes the first phalanx of the thumb on its metacarpal bone, rotating, at the same time, this same phalanx on its long axis from within outward, being thus antagonistic to the abductor brevis pollicis and the flexor of the same name. In regard to the movement of extension of the second phalanx on the first, a result on which Duchenne seems to lay much stress, we must confess that we have not been able to reproduce it.

In most of the useful movements of prehension of the fingers, the thumb is the principal agent upon which we depend to render them effective; hence, it is obvious how necessary it is that all the muscles governing its actions should be in a healthy state to enable us to attain the desired effect.

Nevertheless, we do not intend to convey the idea, that on failure of any one of the muscles forming the thenar eminence all the movements of the thumb would be impeded; experience has acquainted us with the contrary; and this is the place to recall the fact that, in the act of opposing the thumb to the other fingers, a movement upon which depends most or all of our successful manual labor, although all of the muscles intrinsic to the thenar eminence are in active action at the same time, nevertheless, it is not absolutely necessary that they should all be in a state of perfect integrity to allow us to perform many delicate movements with comparative ease.

We have already recognized the utility of the opponens pollicis as an *opponens*, and yet we have had occasion to

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[1] "Physiologie des mouvements," p. 303.

observe that this muscle is not indispensable to the act of opposing the thumb to the two first fingers; consequently sewing, writing, etc., are still possible without its aid. Let it be remembered that in the act of writing, sewing, and holding certain fine tools, it is not necessary that the pulp of the thumb should reach farther than the tip of the index and middle fingers, and that these movements are mainly performed by the intervention of three muscles, *i. e.*, the *abductor brevis*, the *flexor brevis pollicis*, and one of the long muscles of the forearm distributed to the thumb—we refer to the flexor longus pollicis.

Thus, in these most important movements of the thumb the opponens pollicis scarcely takes any part, or perhaps takes none at all, as it acts more particularly in those instances where opposition of the thumb to the two last fingers, *i. e.*, the ring and little fingers, is required. In this case its action is directed specially on the first metacarpal bone, which it then rotates inward, on its long axis, so as to bring it nearer to the palm of the hand, and consequently bringing the thumb itself nearer to the ring and little fingers.

With the help of the opponens pollicis, we are able to hold small objects in the palm of the hand, without requiring the aid of any of the fingers. This muscle and the adductor pollicis on the one hand, and the opponens minimi digiti on the other, are of the greatest service to jugglers in juggling away small objects.

Furthermore, the adductor brevis pollicis, besides producing adduction of the thumb toward the index finger, has also the power, by means of its superficial portion (deep or inner head of the flexor brevis pollicis), to flex the first phalanx of the thumb, at the same time that it rotates it longitudinally, on its metacarpal bone, from within outward. This muscle enables us to develop a good deal

of force in holding a hammer, or by squeezing the thumb laterally against the first articulation of the index finger, as when we intend to break some hard object between these two fingers.

INTRINSIC MUSCLES OF THE LITTLE FINGER.

These are the muscles which are situated on the inner border of the hand, being more or less directly in relation with the fifth metacarpal bone, and which, by their intimate relation between themselves, form the elevation situated anteriorly on the ulnar border of the hand, and known as the hypothenar eminence. They are three in number, viz., the abductor minimi digiti, the flexor brevis minimi digiti, and the opponens minimi digiti. The abductor minimi digiti being the most superficially situated of this group, we shall describe it first.

ABDUCTOR MINIMI DIGITI.

Anatomy.—This, the most superficially and internally situated of the muscles of the hypothenar eminence, lies immediately under the skin. It takes its origin, by aponeurotic fibres, from the pisiform bone, from an aponeurotic expansion derived from the tendon of the flexor carpi ulnaris inserted into that bone, and from a fibrous arch running from the unciform process to the pisiform bone. From this extensive origin fleshy fibres unite and form a somewhat fusiform muscle, which runs from above downward, along the ulnar side of the fifth metacarpal bone to its articulation with the first phalanx of the little finger. At this point the muscular fibres terminate in a short and thick tendon, which is inserted partly into the inner portion of the palmar surface of the base of the first phalanx of the little finger, and partly into the radial aspect of this bone, being at that level in close relation with the tendon of the flexor brevis minimi digiti.

Physiology.—As its name implies, this small muscle is considered by most authors as being an abductor. Cruveilhier simply says: "It is an abductor as regards the axis of the hand."[1] Jamain, Gray, Robert Harrison, etc., speak in the same way; yet, as far back as 1826, John and Charles Bell had recognized that besides this use it also acts as a flexor. In their work on the anatomy and physiology of the human body, they say: "Its use is to spread the little finger sideways, and perhaps to assist the flexors."[2] And further on, while speaking of the flexor brevis minimi digiti, they are still more explicit: "And indeed, the office and place of both (abductor and flexor brevis minimi digiti) are so much the same, that I have marked the last as a flexor; the little difference there is, is only that this performs a more direct flexion."[3] Our own investigations, both anatomical and physiological, have convinced us that this small muscle is to the little finger as the *dorsal* interossei are to the other fingers; namely, it abducts the little finger from the axis of the hand, and at the same time flexes its first phalanx on its metacarpal bone.[4] This fact can be readily demonstrated not only by dissecting the cadaver, but also and more surely by the use of electricity.

FLEXOR BREVIS MINIMI DIGITI.

Anatomy.—This muscle, somewhat smaller than the abductor brevis minimi digiti, along the outer border of which it is immediately situated, arises, partly by tendinous, partly by muscular fibres, from the inner third of the lower border of the anterior annular ligament, from the summit of the process of the unciform bone, and from the outer half of the fibrous arch above described as giving origin to part of the fibres of the abductor minimi digiti. From

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[1] *Loc. cit.* [2] John and Charles Bell: *loc. cit.*, p. 218. [3] *Id.*, p. 218.
[4] See ARCHIVES OF MEDICINE, vol. ix, No. 1, February, 1883.

these points muscular fibres pass obliquely downward and inward to the metacarpo-phalangeal articulation of the little finger, where they terminate in a tendon intimately connected with that of the abductor minimi digiti, and which runs to the ulnar border of the anterior surface of the base of the first phalanx of the little finger, into which it is inserted. The dimension and relation of this muscle are not very constant; it being sometimes very much reduced in size, and at other times wholly included in the abductor minimi digiti, which, in this case, acquires a much larger size.

Physiology.—According to its denomination, this muscle has no other function than to flex the first phalanx of the little finger on its metacarpal bone. Even then it is more particularly auxiliary to the abductor minimi digiti; for, as we have already mentioned, often it is only rudimentary, if not altogether absent; nevertheless, we repeat that, when present and well developed, its excitation by the stimulus of electricity is followed by flexion of the first phalanx of the little finger, and this alone.

OPPONENS MINIMI DIGITI.

Anatomy.—The opponens minimi digiti is situated beneath the two preceding muscles. It is a flat and thin muscle, arising from the inner third of the inferior border of the palmar annular ligament, in connection with the preceding muscle, and from the base of the fifth metacarpal bone. From these origins the fleshy fibres pass obliquely, from above downward and from without inward: the upper fibres, the shortest and most oblique, winding round the fifth carpo-metacarpal articulation, to be inserted into the upper half of the ulnar side of the fifth metacarpal bone; the lower, the longest and less oblique, pass down to the lower half of this bone, and are inserted into its inner border and anterior surface.

Physiology.—This muscle is to the fifth, exactly as the opponens pollicis (*opponens ossis metacarpi pollicis*) is to the first, metacarpal bone ; consequently, its use is to rotate the fifth metacarpal bone and the little finger from within outward, and at the same time bring this bone forward and outward near the long axis of the hand. Hence, this muscle, contracting simultaneously with the opponens pollicis, serves to increase greatly the convexity on the dorsum of the hand, while the concavity in the palm becoming much deeper, forms what is known as Diogenes' cup.

Besides, as we have already mentioned, it helps greatly in holding small objects in the palm of the hand, and in the act of writing, by bringing the little finger forward under the other ones, so as to afford a support to the hand.

EDITORIAL DEPARTMENT.

IN MEMORIAM.

Hervey Backus Wilbur, M.D.

On the morning of May 1st, Dr. H. B. Wilbur, Superintendent of the New York State Asylum for Idiots, died suddenly at the asylum, of heart disease. This most unexpected death takes from us a philanthropist whose loss will be mourned in two hemispheres. Dr. Wilbur was born in 1820 in Wendell, Mass., where his father resided as a clergyman. Graduating at Amherst in 1838, he studied medicine in Pittsfield and Philadelphia. Whilst practising his profession in Barre, Mass., he became so deeply interested in the accounts of Dr. Edouard Seguin's early attempts to educate idiots, that he decided to devote his talents to that work, opening a private school in Barre in 1848. Save a few magazine articles, there was absolutely no English literature upon the subject, and only one French work; therefore he was thrown almost entirely upon his own resources, in the combined offices of physician, teacher, and gymnastic trainer, proving the power of true genius to lift up the lowliest. His success with his private pupils was so marked, that, invited by the New York Legislature, in 1851 he assumed the charge of an experimental school at Albany, which was in 1855 reorganized as the permanent asylum at Syracuse.

For the work to which he gave his life Dr. Wilbur possessed rare qualifications,—an indomitable will undeterred by the obstacles which ever oppose a novel undertaking, unlimited patience with

the feeble efforts of his protégés, a genuine pity for the unfortunate, and faith in the divinity that presides over the feeblest humanity. A true scientist, he had no sympathy with the materialistic philosophy which would put out the light of the immortal soul. To the dignity and innate authority quietly controlling all, was added an unfailing fund of humor that often electrified the dulled intellect of a pupil, placing him for the first time *en rapport* with a master-mind. Rich social qualities, making him a welcome guest in every circle, were combined in his household relations with an individual sympathy and courtesy that secured the earnest co-operation of all his officials and subordinates. It would be truth to say that, by the members of his own family and those who came in nearest relations to him, he was wellnigh idolized. The grief of those who are left behind cannot be measured. Liberal to a fault with what was his own, when giving could contribute to the happiness of his friends or aid the needy, he was scrupulously economical in the administration of the finances of the State. The substantial but inexpensive buildings which stand upon the asylum grounds to-day bear testimony to the careful management which secured to his pupils every needed comfort, with the most conscientious frugality. The benevolence which enwrapped one class of unfortunates could not fail to include all classes, prompting him to labor for the good of all. He was for some time President of the National Association for the Protection of the Insane and the Prevention of Insanity, an office which he resigned a few months since. Comprehending the scientific value of the great laws of natural mental development educed in the progress of teaching the mentally deficient, he was ever ready to impart this knowledge in private circles or educational conventions.

A facile and clear writer, his essays, scientific papers, and reports upon idiocy are the most valuable contributions to that class of literature we have, combining, as they do, the results of his long and varied experience, with a wide acquaintance with psychologists and their writings. The only regret is that he did not write more. Deeply interested and helpful in the foundation of the university at Syracuse, he was from the beginning a

lecturer on mental diseases to its students, addressing them for the last time the day before his death.

The resolutions of the Trustees of the asylum over which he had presided satisfactorily more than thirty years, of the Faculty of the university of which he was a member, of the medical society to which he belonged, and of the committee of Plymouth Church, where he worshipped, testify in the strongest terms to their appreciation of the dead as a Christian gentleman, an illustrious benefactor, a magnetic instructor. The Association of Medical Officers of American Institutions for Idiotic and Feeble-Minded Persons, of which he was the acknowledged leader, will sadly miss the inspiration of his presence and the light of his wisdom.

Mrs. C. W. Brown,
Barre, Mass.

HOSPITALS AS EDUCATORS.

As an exponent of General Medicine, which the Archives of Medicine has always endeavored to be, its editorial columns have from time to time been devoted to suggestions of reform in various medical matters.

Many protests have been filed against the flagrant errors of the accepted method of educating young men for their profession, and the helpless state, in which they find themselves, on graduation, to meet the tremendous responsibilities of a professional life. Leaving our schools with the crude knowledge most of our young graduates have, and being unable, for pecuniary or other reasons, to pursue post-graduate or special courses, they must look for their further education to two sources,—to their own experience, and the experiences of others as published in medical journals.

While their own failures and successes are of inestimable value to them, they are sometimes expensive to them and their patients. To the recorded results of the experiences of others, then, will they look for a large fraction of their post-graduate education.

It is hardly necessary to say that the articles most tasteful and useful to the general practitioner are those based on a wide and

varied clinical and pathological experience. For these, it is very natural to look to the attending physicians and surgeons of our general hospitals, for they, if any, have an abundance and a complete control of clinical and pathological material.

A hospital service *should be* very fruitful. It implies a large number of cases of the commoner forms of acute and chronic disease; an excellence and uniformity of diet and hygienic surroundings unattainable elsewhere; the tremendous aid afforded by skilled nurses, and intelligent, studious internes in noting, collecting, and recording clinical observations; and the relatively large percentage of cases rendered complete by a thorough, scientifically conducted and recorded autopsy.

These are some of the advantages of a hospital service which the best private practice cannot offer. From the recipients of these advantages one would certainly expect very valuable contributions to medical science.

Let us see what light statistics throw on this subject.

New York contains twenty-two general hospitals, exclusive of asylums, homes, and general and special dispensaries. The duties of attending physicians and surgeons to these hospitals are discharged by 121 practitioners.[1] Of these, 104 have one appointment only, 14 attend two, and 3 attend three hospitals. Besides the attendings there is a large body of consulting physicians and surgeons, and consulting and attending specialists. During the year 1881–2, there were treated at these twenty-two hospitals, 45,683 in-patients. This would allow each attending the yearly disposition of the results of the observation and treatment of 377 cases. It would not strike the average observer as unreasonable that, at the end of a year or more, sufficient data might be accumulated from this amount of material to form the basis of several interesting and instructive clinical, pathological, or therapeutical communications.

Let us again adduce figures to help us decide how much is harvested from this vast and fertile field.

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[1] Many of these are, in private practice, professed specialists.

During the year ending January 1, 1883, we find that only 62, or one half of these attendings, made *any* contribution to domestic or foreign medical journals. The names of 59, or nearly one half, do not appear as having made the slightest addition to current medical literature during the year.

The 62 writers made the following contributions:[1] 2 books (one a fifth edition), 85 original articles, 33 clinical lectures, and the bare narration of 135 cases. An equal allotment of these communications to the 121 attendings would credit each with one sixtieth of a book, one quarter of a clinical lecture, two thirds of an original article, and one case and a half; in truth, a rather poor showing for the observation of 377 cases.

To summarize our reckoning as far as we have gone, we have

General hospitals in New York City.	Attending physicians and surgeons.	Number of cases treated in one year.	Published contributions during a year:	
22	121	45,683	Books,	2
			Clinical lectures,	33
			Original articles,	85
			Recorded cases,	135
22	121	45,683		255

Thus we see that in 22 hospitals, 121 physicians found in 45,683 patients material enough to form the basis of 255 communications to their less fortunate brethren.

The yearly yield of scientific contributions from each attending is thus 2

From each hospital 10

While each article is the result of observations on patients to the number of 187

Considering that, of these physicians, many have professorships in our medical schools, and all have private practices from which to derive experience, and that many of their literary productions are the results of such experience, the actual outcome of the bedside observation of 45,683 cases, or half that number if you please, is truly pitiful.

[1] A very large proportion of *all* communications are from avowed specialists.

We ask: Where lies the error? Who is to blame?

As one half of the attendings contributed nothing, and allowing that one half the hospitals are not productive, and one half the cases too commonplace for notice, it would change the above averages for the better, but still leave them inexplicable: four articles for each attending, for each hospital twenty articles, each founded on the observation of ninety-three cases. With these concessions we claim the figures are not extravagant, and the charge of error there, has now no substantiation.

Is, then, this unproductiveness chargeable to the hospital organization, the real poverty of material, or the apathy of the attendings?

Of material we claim there is no poverty, but rather an abundance, but an abundance which is rendered almost useless by our bad hospital organization. This has been dwelt upon before in this journal, and a summary of proposed remedies reads as follows:

"1. The creation of small services, each consisting of from 25 to 60 beds, according to the size of the hospital.

"2. Each service to be under the continuous care of one visiting physician or surgeon for a period to be fixed by regulation, say ten or twenty years.

"3. The selection of the visiting physicians and surgeons upon the basis of personal and professional merit, and also upon their special qualifications for taking charge of services intended to receive certain classes of diseases. This would establish the hospital work upon the same basis as the higher class of private practice, viz., upon the principle of the cultivation of specialties, or of departments of medicine.

"4. The creation of a much larger staff of internes, first for the purpose of securing better attendance upon the patients of the hospital, and also for the (no less meritorious) object of educating a greater number of physicians previous to their settling in private practice.[1]"

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[1] Higher Medical Education in New York. Reorganization of the Medical Staff of Hospitals. Dr. E. C. Seguin in the ARCHIVES OF MEDICINE, June, 1881.

Since the editorial, from which the above is an extract, was written, decided advances in lengthening the terms of service have been made in some of our hospitals; but even in these the body of internes has not increased, and is still too small for a proper performance of their duties, and *very much* too small to render clinical material of service to them or available to their superiors.

Now just here lies one great obstacle to the proper utilization of clinical material, and, in justice to our internes, let us state that we by no means think it is primarily their fault, but a natural outcome of lax discipline, and a misconception of their obligations; which is implicit obedience to superiors.

By this it is not meant that the attending should treat his house-staff as a group of school-boys, but by regular visits, by an untiring enthusiasm, by a thorough instruction in history-taking, by the sifting and grouping of symptoms, by demonstrations of systematic methods of physical exploration, by attention to hygienic details, and by polite, considerate treatment of patients, to arouse a like enthusiasm on the part of the internes.

Such an example, on the part of attendings, is rare, and as a consequence "rounds" are a drudgery, there is no enthusiasm, history-taking is slighted, and physical examinations are superficial. This we claim does not arise primarily from a disinclination on the part of the interne to work, but from the fact that some attending has set the example of irregularity and superficiality.

At any rate there develops in most of our hospitals a relaxation of method and discipline which works ruin to attending, interne, patient, and science. The attending ceases to be teacher, the interne is no longer scholar, the patient suffers, and science languishes.

Until a change comes—until the house-staff, still students, eagerly gather round the bedside to hear the words of the master, to watch his methods of examination, diagnosis, rational and logical therapeusis—until then countless rare forms of disease will remain undescribed and unstudied except by a favored few.

There are many other reasons why our hospital men are non-producers in the literary field, and among them are these: Many have lecture or professorial appointments at our schools, many have official positions, and all have exacting if not lucrative private practices, and with one consent they say they have not time for literary work. Here is a truly pitiable state of affairs: the men of vast experience and with peculiar advantages for writing have no leisure, while those with leisure have no advantages, and so our journals often harbor articles which the experienced, over-busy practitioner decries as unpractical and visionary, while the solid, well-tried *facts*, upon which a sensible, instructive article might be based, lie as closely shut in his own head and every-day life as in a vise, where they will lie for years, and with the collector or originator will die.

As another excuse, you hear: "Oh, I don't want to rush into print with so few cases or so little experience." Such are always waiting for another case or two, or for a little more experience, until, often, some less conservative man with fewer cases and less experience steps forward, and before all the world gets the credit of advanced ideas not by right his own. Such men never rush into print, nay, cannot even be forced into print, and, while they die with a name, leave nothing to perpetuate that name.

The number of these procrastinating or diffident men is large. There is a partial remedy at their hands and let them use it. Let them encourage their hospital internes to publish freely, well recorded, thoroughly observed cases of interest under their care, and let the reading public thus have some benefit of their material. Such communications would of course not fill the place of mature, well-written articles, but from them the reader could deduce his own conclusions and derive much benefit.

The protest that medical writing "don't pay" pictures a mercenary spirit unworthy a liberal profession and beneath our notice. The fact that published writings not only "don't pay," but in many cases necessitate a small pecuniary outlay on the part of the author, should not prevent us from endeavoring to elevate the science of which we all are and ever shall be students.

But now let these few pages, full of complaints and reproaches, end with words of gratitude and praise. There are among us men who will take time from their practice, from their hours for sleep, from their very lives, to contribute to science. There are others more sensible, though no less enthusiastic, who, when they have not time for both, will give up a part of their lucrative, for scientific work ; others still, lacking time or taste for such work, will put their interesting clinical and pathological material at the disposal of one worthy and anxious for it. There are others still to whom these broad fields of practice are unattainable, who plod along, delving into the by-ways of physiology and experimental pathology, discovering facts and incorporating them into articles at which the clinician sneers as unpractical, but which, from the days of Galvani and Harvey, have been the solid foundation on which is reared their haughty superstructure of modern therapeutics. R. W. AMIDON.

NEW BOOKS AND INSTRUMENTS.

Diagnosis of Ovarian Cysts by Means of the Examination of their Contents. By Henry Jacques Garrigues, A.M., M.D. New York: William Wood & Co., 1882, pp. 110.

This monograph is an elaboration of the paper read before the American Gynæcological Society when it met in New York a year ago last fall; afterward it was published in one of the New York medical journals. At the meeting referred to, the subject led to an animated discussion which centred mostly upon the opinions held in regard to the so-called ovarian corpuscle of Drysdale, which proves to be a bone of contention to ovarian histologists. Dr. Garrigues takes the rational view that Drysdale's so-called "ovarian granular cells" are nuclei of epithelial cells undergoing fatty degeneration, as the large Bennett's or Nunn's corpuscles are the epithelial cells undergoing a similar transformation. He supports his view by the argument that similar cells have been found by Lebert, who has given them the name of "pyoid bodies," not only in ovarian fluid, but in the peritoneum, in the synovial membrane of the knee, in congestive metastatic abscesses, and often mixed with common pus corpuscles both in extravasations and in the false membranes on mucous and serous membranes. He contends that ether affects both the Bennett's and Drysdale's corpuscles alike, if it affects either, and he clinches his argument with an illustration of what the microscope reveals in regard to the transition from nuclei of the epithelial cells to Drysdale's corpuscles.

He bases his diagnosis from examination of the fluid, not with certainty on the *physical* characters. Viscidity, the most important of these, may be wanting in ovarian and present in non-ovarian fluid. A high specific gravity is not an unfailing sign. There is no *chemical* product, he says, peculiar to ovarian fluid.

There is no pathognomonic *morphological* element. The columnar epithelial cell excludes all other tumors than those of the ovary, fallopian tube, and broad ligament, possibly the pancreas. With such negative statements as these, one is inclined after a careful perusal of the work, with its exhaustive study of the subject, and its fine illustrations demonstrating what the microscope reveals, to agree with Dr. Engelmann's remark made after hearing the paper read at the Gynæcological Society: "Scientifically, I think the paper one of extreme interest; but practically, I do not think very much is gained by tapping simply for the purpose of examining fluid microscopically."

As a discovery peculiarly his own, the author claims amœboid corpuscles, which he only saw in one case. He also mentions, as a matter of practical importance hitherto overlooked, the power of resistance to decomposition possessed by ovarian fluid. In one case the fluid, after an interval of four months, was re-examined, and the histological elements were in an excellent state of preservation.

Dr. Garrigues closes his work with a few remarks on tapping; its feasibility and its dangers. The subject is a matter of as diverse and determined opinions as the Drysdale's corpuscles. Some hold it an extremely dangerous proceeding; others, always adding the saving clause, "if it is done with proper precaution," do not think so. In making a diagnosis of ovarian cysts by means of their contents, the question becomes one of supreme importance. [G. P.]

A Dictionary of Medicine, Including General Pathology, General Therapeutics, Hygiene, and the Diseases Peculiar to Women and Children. By various writers. Edited by RICHARD QUAIN, M.D. New York: D. Appleton & Co., 1883, pp. 1,809.

The whole title of this ponderous tome has been given, since it will convey to the reader the ground which the editor has sought to cover in his great task of presenting to the medical profession a new dictionary. It will be seen that he does not mention surgery and materia medica. He explains in the preface that, though he has found it necessary to include some notice of diseases which fall more generally under the care of surgeons, the work does not pretend to be a dictionary of surgery, and although he has discussed subjects of general therapeutics, he has had no intention of invading the domain of materia medica.

The vast array of facts and observations which are poured out upon the medical profession, perhaps more largely than upon any other, at the present time,—facts and observations of sufficient merit to demand preservation, make the editing of a dictionary worthy to be classed among the labors of Hercules.

A man addressing himself to the difficult undertaking, when looking at the modest medical dictionary which sufficed the practitioner of the previous generation, must feel like the fisherman of "The Arabian Nights" as he stood on the sea-shore gazing at the terrible genie who, thin and cloud-like, towered heavenward, enormously exceeding in size the small casket in which he had been imprisoned for years, and from which he had just escaped.

Dr. Quain, however, with his coadjutors, if not able to return the expanding genie of increased medical knowledge to his former narrow quarters, have been able by the subtle craft of the pen to reduce him to a place between the covers of one volume, and to fasten him down by means of an appendix.

But abandoning metaphor, the reviewer, whose task, were he to enter into details, would be second only to that of the editor, advances from the preface to the book itself. The series of monographs of the various diseases, descriptions of which go to make up the bulk of the work, are evidently prepared with great care, and the information given on recent and disputed subjects seems to have been collected with impartial and equitable judgment. Each specialist in looking to see if his department is well represented in the book, will doubtless find here and there something to question in description, pathology, or treatment of the different diseases, or discover something omitted.

Especially interesting are the parts of the book devoted to nervous affections. The articles are very concise, yet they cover as much ground as many a volume of pretentious size which has been issued on those diseases alone. More than one hundred of the closely printed eighteen hundred pages are devoted to this subject. Brown-Séquard writes of epilepsy and spinal irritation; Broadbent of chorea; Hutchinson and Gower of much that relates to the brain; while H. Charlton Bastian fills in the gaps left by the others.

Many of the descriptions of parasites which infest the human body are given by T. S. Cobbold in the most thorough and careful manner, and are fully illustrated. V. Horsley in the appendix presents a summary of the views held in regard to the various kinds of bacilli, which will be read with interest by those who have been

unable to keep up with the current literature on that topic. If the portions of the work relating to hygiene were collected together, they also would furnish the material for a good-sized book on that subject. It includes a dissertation on hospitals by Douglas Galton ; a treatise on disinfection by James A. Russell ; a long and flowery article on personal health by Reginald Southey. Nurses and nursing are written about by Florence Nightingale, in so thoroughly an English manner that one feels at once the atmosphere of the English hospitals.

The microscope, the ophthalmoscope, hæmatometer, cardiagraph, and sphygmograph are carefully described, and directions given for their use. The student, however, would hardly think of relying upon a dictionary for instruction in the employment of these instruments ; nevertheless, he would be pleasantly surprised at the amount of information given.

As a whole, the volume is interesting as a piece of mosaic work, since it brings together the compositions of so many distinguished writers with all the variety of style characteristic of the number of individuals who write. The contributors, with few exceptions, are English, and consequently the tone of the book itself is thoroughly English.

After looking through such a work as this the conclusion is forced upon one that the most difficult of all writing must be that for a dictionary and encyclopædia, if it is properly done. The writer who can convey the most information in the fewest words is at a premium. The dictionary is no place for verbosity or the flowers of rhetoric. While most of the contributors have shown unusual skill in this matter, here and there are articles, to which are appended great names, where lines and paragraphs could have been pruned without decreasing the information given in the slightest. For instance, the Latin poetry and proverbs quoted by one could be spared ; another counsels the reader, in a multitude of words, not to come to a hasty conclusion ; a well-known writer on gynæcology prefaces his definition of the diseases of women with the following : "Making liberal allowance for the proverbial difficulty of framing definitions that should be proof against criticism and against the infinite complications of natural history, we may cite the following as presenting a minimum view of the work of the gynæcologist."

Quain's "Dictionary of Medicine," as a book to place on the shelves of a medical library, would elicit different opinions, according to the taste of the owners of the different libraries.

Those who have but few books, and are accustomed to take their information in a condensed form rather than going to extended treatises on various subjects, might say, in the well-worn words every publisher's advertising circular appends to works good, bad, and indifferent, "No practitioner should be without it"; while others might agree with us that the work falls short of being a perfect dictionary, since it omits surgery and materia medica almost entirely, and fails to mention and define words which one would expect to find in a dictionary which should be to medicine what Webster's or Worcester's unabridged is to the English language; neither is it a complete encyclopædia, which it more nearly resembles when the word is used in its ordinary signification. Nevertheless, the work is exceedingly instructive, though somewhat suggestive of the "Family Physician" and similar works prepared to instruct the laity. [G. P.]

The Pharmacopœia of the United States, sixth decennial revision. William Wood & Co., New York, 1882, 8vo, pp. 488.

The Therapeutic Hand-book of the United States Pharmacopœia, etc., etc. By Robert T. Edes, A.B., M.D. (Harvard). William Wood & Co., New York, 1883, 8vo, pp. 397.

1. A much more pretentious volume exteriorly than its predecessor of 1870, it is, when opened, much less pleasing to the eye, its pages looking black and harsh beside the tasty, extra-leaded page of the former edition. It would seem also that, as the material is alphabetically arranged, a great deal of space might be saved, and the book rendered less bulky, by making the print more uniform, instead of putting six or seven kinds of type on the same page.

An historical introduction and abstract of the proceedings of the convention begin the book. In the preface some space is given to nomenclature. Why well-known drugs, as belladonna, etc., should be exceptions to the rule making the genus name proper, is not stated. The rule, making the officinal Latin title sufficient to stand for the *part* of the plant used (when only one is used), is a good one.

A number of obsolete and unused drugs and preparations have been dismissed, but the question whether the number could not have been increased is a very pertinent one. The preparations dismissed were two hundred and twenty-nine in number,

while those added were two hundred and fifty-six, thus leaving the number of titles in the last revision nine hundred and ninety-seven, against nine hundred and seventy in the former.

With a view of curtailing the list, the suggestion is made that persons selling medicines send to the Chairman of the Committee a list of articles and preparations which have not been ordered or have been called for seldom.

While considerable prominence is given to the metric system throughout the book, the wonder is that the old system of weights and measures, at this late date, is still given precedence (pp. xxxix, 363, etc., etc.).

A little more consideration is shown the centigrade scale, whose figures are followed by those of Fahrenheit in brackets. The list of reagents and test and volumetric solutions commencing on page 387 is useful. The table of thermometric equivalents is very full; as are those following on specific gravity, solubility, and saturation.

2. As a book much like the former but still, typographically, more pleasing.

In the preface, the author feels called upon to apologize for the size of the book by saying the ideal Pharmacopœia is yet far off, its advent depending on the progress of chemistry and physiology, "and upon that of pathology, which shall analyze diseases into their essential symptoms and show how far these may be advantageously controlled or modified."

He suggests "principles of treatment rather than to mention the name of each disease in which each drug has been or may be used."

It is to be regretted that the author gives the old system of weights and measures the precedence. The metric doses are sometimes spelled out in full (as "two centigrammes"), and generally repeated in figures enclosed in brackets (as two to five grammes [2. to 5.]), a seemingly needless repetition, as the simple figures, carefully punctuated, should be enough.

The endeavor of the author to be concise is very commendable, and, on the whole, very successful. His treatment of the subject of ergot, for instance, occupies only forty-three lines; quinine, four pages, etc.

This excessive conciseness evidently leads him into some errors of omission, but these are few and trivial. Among them may be noted a failure to state the anatomical parts affected by conium and gelsemium.

More space than they deserve seem to be given to some drugs,

viz., Sanguinaria, Lobelia, etc. His statement that a single .001 dose of atropine produces on most persons hardly a noticeable effect, is contrary to common experience.

Hardly enough credit, we should think, is given to oxalate of cerium as a remedy for nausea or hyperemesis.

The dose of the fluid extract of valerian, as an anti-spasmodic, is too small (1.–2.), as is that of digitalis.

Nothing is said about the hypodermic use of Fowler's solution, so innocuous and efficacious.

He very sensibly states, it is no undue timidity to regard .016 of morphine, given subcutaneously to a patient with whose peculiarities the physician is not familiar, as a dangerous dose, after the administration of which the patient should not be left without a careful watcher. "The point at which the injection, if the drug is given in this form, should be made, is usually of no consequence; but it may be well, in some cases, to get the counter-irritation, or the moral effect due to a puncture, as near the seat of pain as possible," is another statement which should come to the notice of many who still believe in the local effects of anodyne or tonic hypodermics.

He prohibits the administration of cod-liver oil when its use prevents other food from being taken, as it then does more harm than good.

In the three pages devoted to bromide of potassium he calls attention to the possibility of bromism obscuring and complicating the symptoms of cerebral disease in such a way as to lead to an unduly serious prognosis. He considers bromide one of the best corrigents of morphine, and that it should be given, if possible, two or three hours in advance of the opiate. The statement, that the bromide greatly relieves nervous disturbances occurring at the change of life, will not receive universal endorsement, and the picture he paints of the very important condition of bromism might be more detailed and vivid.

On the whole, the book is admirable; very concise, highly practical and readable; a very pleasant change from our formal, prolix, and argumentative works on materia medica and therapeutics. [R. W. A.]

ORIGINAL OBSERVATIONS.

A CASE OF BRACHIAL MONOSPASM AND MONOPLEGIA WITH SARCOMA OF ASCENDING FRONTAL CONVOLUTION.*

By W. R. BIRDSALL, M.D.,

ASSISTANT PHYSICIAN TO THE NERVOUS DEPARTMENT OF THE MANHATTAN EYE AND EAR HOSPITAL.

The following interesting history of a case from the practice of Dr. J. R. Macgregor, of New York, I am able to present by his kind permission.

History.—A female, æt. forty-four, had had for the past two years a pedunculated growth on the anterio-lateral surface of the left thigh, about four inches below the anterior superior spinous process. This was ligated by Dr. Macgregor over a year ago, and sloughed off ; soon, a return of the growth took place, increasing in size until it appeared as a red, livid, fleshy mass about the size of an almond, connected with the thigh by a narrow pedicle, the skin around which presented three or four red pea-sized elevations above the skin. Some bloody oozing took place from the large tumor. The inguinal glands soon became enlarged. Last autumn the patient was much worn down by her husband's fatal illness. He died of phthisis in November. From December on, the patient had constant fronto-temporal headaches, more marked on the right side, and usually diurnal. The scalp was never tender. She felt feverish, and her pulse ranged from 80 to 100 ; strength and weight were gradually lost. Quinine and tonics failed to give relief. The headache gradually increased in severity, occasional attacks of vertigo occurred, and sudden attacks of vomiting, often in early morning. One day in February, 1882, while Dr.

* Read before the Medical Section of the New York Academy of Medicine, April, 1882.

MacGregor was away, the patient had a peculiar attack, the details of which are imperfect. She was found partly unconscious, and with a paralysis of the left arm; she soon regained consciousness, but the arm never improved. The patient herself states that before becoming unconscious her left cheek and left arm jerked. During the last week in February her sister saw an attack of jerking, consisting of clonic spasms of the left arm, the face doubtful, but positively none in the leg; then palsy in the arm became complete. During March her speech became indistinct; emaciation became great; she was unable to stand without help, and together with the vomiting and continual headache, occasional periods of stupor supervened. No eye-symptoms were observed. No albumen in the urine, or the appearance of cachexia. No suspicion of specific trouble was entertained concerning the patient or her husband. Dr. Macgregor made a diagnosis of cerebral tumor of the right hemisphere. Dr. E. C. Seguin, who saw the patient in consultation with Dr. Macgregor, in March, concurred in the diagnosis made, and ventured the opinion that the lesion was in the ascending frontal and posterior portions of the second frontal gyri (centre for arm and face), probably of the same nature and secondary to the fungous erectile tumor on the thigh. At this examination the following notes were made: Habitually slow but correct answers; no aphasia; speech thick; pupils normal; optic discs perfectly normal; veins somewhat full. Left cheek paretic; tongue imperfectly projected, deviating slightly to the left; cranium not tender. Absolutely flaccid palsy of the upper left extremity; decided anæsthesia of the left hand to pinching—the patient was not in a condition to respond to finer tests. Ability to move the feet and legs freely and quickly; heart normal; growth on left thigh as above described; some enlargement of glands in the right posterior cervical triangle.

On March 20th I saw the patient with Dr. Macgregor, at Dr. Seguin's request, at which time the optic discs still remained in the condition described above; the other symptoms also remaining the same, except that she complained of severe pain in right arm, and the partially comatose periods had been more profound and of longer duration.

On April 2d, after a convulsive movement of the left face and arm, she died comatose. The general treatment consisted in the use of potassium iodide, tonics, and morphine to relieve pain.

Dr. Macgregor witnessed one of the convulsive attacks, in which, without loss of consciousness, or asphyxia, clonic movements, oc-

curred in the face and arm on the left side, for a longer period than an ordinary epileptic attack. It was not followed by somnolence.

Autopsy, made twenty-four hours after death, by Dr. Macgregor and myself, revealed a normal cranium; a not unusual fulness of meningeal veins; a soft fluctuating spot on right parietal eminence, observed before removal of dura; on removal of latter, adhering at several points along the longitudinal sinus, and at the point of fluctuation mentioned; escape of a thin yellow fluid when separated from this position, presenting a deep reddish-brown oval mass, looking like clotted blood, and measuring two by three cm., on section, three cm. in depth, nearly spherical, not easily separated from the enveloping cerebral tissue, and exhibiting in the centre a cystic degeneration which had been filled with

FIG. I.
Right hemisphere, showing location tumors Nos. 1, 2, 3, 4, and 7.

the yellow fluid above described. This mass occupied a portion of the ascending frontal convolution, at about the level of the fissure separating the superior from the middle frontal convolution, impinging upon the first and second frontal convolution; the mass presssed upon the middle portion of the ascending parietal convolu-

tion also. Another spherical mass, fifteen cm. in diameter, of firmer consistence, occupied the posterior portion of the superior temporal convolution, near the angular gyrus. A third spherical mass, fifteen cm. in diameter, was situated four cm. in advance of the first growth, in the middle frontal convolution. A fourth mass, seven cm. in diameter, was situated still farther forward, in the middle frontal convolution, so far underneath as to be almost on the orbital surface. All these masses involved the cortical substance. On section, the ventricles were found normal. On section in a line transversely through the middle of the right caudate nucleus, a small mass, the size of a pea, was found just external to it in the white matter.

FIG. 2.
Transverse vertical section of left hemisphere, showing tumor No. 5.

On section through the left hemisphere, a spherical mass about two cm. in diameter was found in the ascending frontal convolution, but too deep in the white matter to involve the cortex. Another pea-sized mass, making the seventh in number, was found in the right semilunar lobe of the cerebellum. It involved the cortex, but was not visible on the surface; the color of this

growth was a deep black. No other evidence of disease was found. We were not permitted to remove the brain, but parts of the tumors and a portion of the medulla and cord were secured, for the purpose of searching for secondary degeneration; the latter is not as yet sufficiently hardened for examination. An examination of the neoplasm shows it to be of the sarcomatous type, resembling the round-cell or glio-sarcoma. The growth

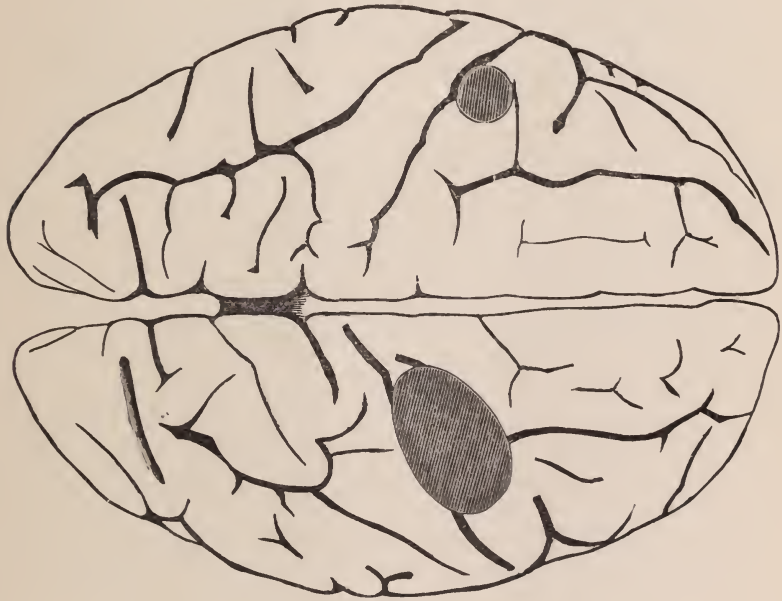

FIG. 3.

Convexity of hemispheres; right; below showing tumors No. 1 and 6. The latter not apparent on the surface.

would form an interesting study of the variations in structure which exist in sarcomas, for we find, in some portions, that decided pigmentation of cells characteristic of melano-sarcoma; in others the type of the angio-sarcoma was particularly prominent; in some parts, appearing like a series of channels without the definite walls of blood-vessels, producing an extremely vascular condition of the tumor; still other portions of the tumor had a myxo-sarcomatous appearance. Large cells containing daughter cells presented an approach to the giant-cells of sarcomas; the fibrous elements were scanty. The most compact portions appeared around the blood-vessels. The margin of the growth was pretty well defined,

but not strictly encapsuled, and neighboring parts of the white tissue possessed a richer development of neuroglia cells,—or, if you will, sarcoma cells,—than normal. The character of the tumor readily accounts for its rapid progress, and leaves little doubt that the tumor on the thigh, which had not been examined, was of a similar nature. Other secondary growths would in all probability have been found if we had been permitted to examine the other organs of the body.

The principal interest in the case centres in the question of the localization of the lesion in relation to the symptoms. Growth No. 1 was situated in the motor area for the upper extremity, and perhaps of the face, the upper portions of the ascending frontal and parietal convolutions (centres for the lower extremity) being free from disease. Growths No. 3 and No. 4 were too far forward in the frontal region for us to expect motor symptoms. No. 2 falls in the region to which visual functions have been attributed; in this case no disturbance of vision had been described, to say the least. What effect the small growth, extending to the caudate nucleus, had in producing symptoms, we are unable to say. Judging from the extremely interesting relations of the growth in the left ascending frontal convolution, which gave rise to no symptoms during life, except that pain was described, and which did not involve the cortex, we may perhaps infer that the white matter was pushed aside to a sufficient extent to prevent much irritation or disturbance in these portions. The presence of decided anæsthesia in the paralyzed hand seems to favor the view supported by Exner's conclusions, that tactile sensation is represented in the same cortical areas in which associated motor functions are located.

The absence of inter-cranial effusion and of choked disc with the presence of these several growths, should not be forgotten.

INDEX.

Archives of Medicine

A BI-MONTHLY JOURNAL

DEVOTED TO ORIGINAL COMMUNICATIONS ON MEDICINE, SURGERY, AND THEIR SPECIAL BRANCHES

EDITED BY

E. C. SEGUIN, M.D. AND R. W. AMIDON, M.D.

S'il est possible de perfectionner l'espèce humaine, c'est dans la médecine qu'il faut en chercher les moyens.

—DESCARTES

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ARCHIVES OF MEDICINE.

Original Articles.

THE INTERNAL CAPSULE OF THE CEREBRUM AND THE DIAGNOSIS OF LESIONS AFFECTING IT.*

BY AMBROSE L. RANNEY, M.D.

IN connection with the description of the so-called basal ganglia (the "corpus striatum" and "optic thalamus" of each hemisphere), I have mentioned a tract of fibres, called the "internal capsule of the cerebrum." This bundle has an anatomical peculiarity, which has brought it into prominence with both physiologists and neurologists, viz., that it seems to traverse the substance of the basal ganglia without any apparent structural relation with the nerve-cells found within them. It is by no means certain that the nerve-cells referred to may not, in some indirect manner, be yet proven to modify or govern the impulses which travel along the fibres of the internal capsule (as we have every reason to believe they do in the case of other fibres which pass from the cortex to the crus, pons Varolii, and spinal cord); but, at present, we are compelled to admit that this bundle appears to afford the only *direct communication* between the convolutions and parts below the cerebrum,[1] because any intervention on the part of the corpus striatum

*A lecture delivered before the class of the Medical Department of the University of the City of New York, during the session of 1882–83.

[1] The fibres of the "external capsule of the cerebrum" may be an exception. (Fig. 1.)

or the optic thalamus has not been conclusively demonstrated.

This tract seems to be a continuation of both the *motor* and *sensory* portions of the crus (the "basis cruris," and "tegmentum cruris," of Meynert—see Fig. 3) into the white substance of the cerebral hemisphere of either side, where its fibres diverge and pass to the convolutions. It forms the greater part of the so-called "corona radiata," which was described in a previous lecture.[1] If we trace the anterior fibres of this bundle from below upward, we shall see that it divides the corpus striatum of each hemisphere into its two portions, the caudate and lenticular nuclei. Its posterior fibres separate the lenticular nucleus from the optic thalamus of the corresponding side. The diagram, to which I now direct your attention, will make the relations

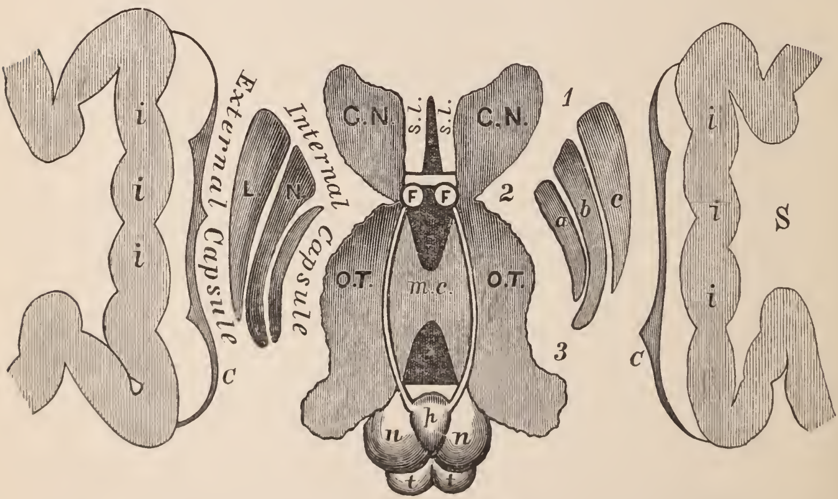

FIG. 1.—A DIAGRAM DESIGNED TO SHOW THE RELATIONS OF THE INTERNAL CAPSULE OF THE CEREBRUM TO ADJACENT STRUCTURES VIEWED FROM ABOVE. The section of the brain has been made *horizontally* in a plane to intersect the basal ganglia C. N., caudate nucleus of corpus striatum; L. N., lenticular nucleus of same with its three parts (*a*, *b*, *c*); O. T., optic thalamus; S, fossa of Sylvius; C, claustrum; E. C., external capsule of cerebrum; *i*, *i*, *i*, convolutions of the island of Reil; *a*, *b*, *c*, the inner, middle, and external member of the lenticular nucleus; 1, anterior limit of the internal capsule; 2, "knee" or bend of same; 3, posterior limit of same; F, crura of fornix, the fifth ventricle lying in front, and the third ventricle behind it; *s. l.*, septum lucidum, showing its two layers with fifth ventricle between them; *m. c.*, middle commissure of the thalamus; *p*, pineal gland and its peduncles; *n*, nates cerebri; *t*, testes cerebri.

[1] *N. Y. Med. Jour.*, April 16 and 24, 1883.

of this bundle apparent, while it will also show the peculiar angle or bend which the internal capsule exhibits in all horizontal sections of the brain which intersect the basal ganglia.

Now, if a cross vertical section of the cerebral hemispheres be so made (see Fig. 2) as to include the substance of the thalamus and the lenticular nucleus, it will be perceived that the peripheral outline of these two masses of gray matter may be compared to a square; and that a diagonal band running from the outer and upper corner to the lower and inner corner of this square corresponds to the situation of the compressed portion of the "internal capsule," which is included between these ganglia. Above the level of the basal ganglia, the fibres of the internal capsule radiate to join certain convolutions or "gyri" which will be enumerated later. Thus it is that the fibres of the internal capsule appear in most of the cross-sections of the middle zone of the cerebrum to bear a resemblance to the handle and sticks of a Japanese fan; the handle being the constricted portion between the corpus striatum and the optic thalamus, and the diverging fibres being located within the medullary centre of the cerebral hemisphere.

The extension of *sensory fibres* from the tegmentum cruris upward within the internal capsule of the cerebrum is not so clearly proven as is the continuity of the *motor tract*, anteriorly. The course of the former has been studied by dissection, embryological investigation, physiological experiment, and, finally, by the examinations of pathological processes. It has been shown by Türck[1] that, when certain convolutions of the brain (chiefly those which are motor in function) have suffered partial or complete destruction, that a *descending degeneration* follows the course of the nerves

[1] This author first made known his great discovery to the Academy of Sciences of Vienna, in 1851.

which are connected with the cells of the injured part. This degenerative process extends along the nerves, from the cells of the cortex, to their peripheral terminations, in the cells of the spinal gray matter; thus enabling a careful observer to trace the paths of the fibres with even greater

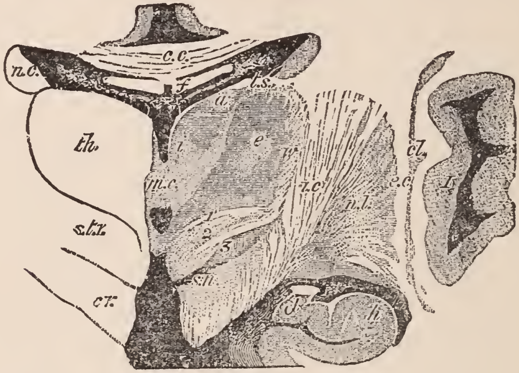

FIG. 2.—SECTION ACROSS THE OPTIC THALAMUS AND CORPUS STRIATUM IN THE REGION OF THE MIDDLE COMMISSURE. (Schäfer after a preparation by Mr. S. G. Shattuck.) Natural size. *th.*, thalamus; *a*, *e*, *i*, its anterior, external, and internal nuclei respectively; *w*, its latticed layer; *m. c.*, middle commissure; above and below it is the cavity of the third ventricle; *c. c.*, corpus callosum; *f*, fornix, separated from the third ventricle and thalamus by the velum interpositum. In the middle of this are seen the two veins of Galen and the choroid plexuses of the third ventricle; and at its edges the choroid plexuses of the lateral ventricles; *t. s.*, tænia semicircularis; *cr*, forward prolongation of the crusta passing laterally into the internal capsule, *i. c.*; *s. t. r.*, subthalmic prolongation of the tegmentum, consisting of (1) the dorsal layer, (2) the zona incerta, and (3) the corpus subthalamicum; *s. n.*, substantia nigra; *n c.*, nucleus caudatus of the corpus striatum; *n. l.*, nucleus lenticularis; *e. c.*, external capsule; *cl*, claustrum; *I*, Island of Reil.

accuracy and positiveness than the most skilful dissector could possibly hope to attain. By means of this fact,[1] amplified somewhat by Waller, physiologists have been enabled to solve many problems regarding the origin and course of special nerves, as well as of certain nerve-tracts within the spinal cord and brain, which could not otherwise have been determined.

Although the remarkable observations of Türck were given to the profession some years before Waller was awarded the honor of meriting recognition as the recipient of the Moynton prize for Experimental Physiology, his

[1] The reader is referred to a lecture upon the "Wallerian Method of Research," by Prof. Dalton. *Med. Record*, Feb. 11, 1882.

paper remained comparatively unknown for some years, when its great value at last became recognized. The difference between the discoveries of Waller and Türck lie in the fact that the observations of the former were confined to the results of artificial section of spinal nerves, made for the purpose of studying the effects of such injuries, while those of Türck were of a purely pathological character, in which the results of old morbid deposits within the substance of the brain were studied by the aid of successive sections of the brain and spinal cord at different levels, which could be contrasted with each other. Both of these observers arrived at the same fundamental law, viz., that injuries of nerves or of nerve-tracts cause a degenerative process which extends along the separate nerve-fibres to their ultimate ramifications.[1] Waller's experiments were confined exclusively to the spinal nerves, and resulted in the following deductions: 1, That if the nerve was divided at its exit from the vertebral canal, *all of its ultimate fibres degenerated* for its entire length; 2, that if the anterior root of the nerve was alone divided, only the *motor fibres* degenerated; 3, that if the posterior root of the nerve was severed outside of its ganglion, the *sensory fibres* of the nerve degenerated and the motor fibres remained unaffected; 4, that if the posterior root was divided *internal to its ganglion*, the nerve outside of the ganglion did not degenerate, but the portion which was still attached to the spinal cord, but separated from the ganglion, suffered complete degeneration. From these data, this observer was enabled to lay down the general law that *the motor fibres of the spinal nerves are dependent for their structural*

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[1] Nerve-fibres degenerate only when severed from their connection with some special nerve-centre. When once cut off, the degenerative process extends throughout the entire length of the nerve; unless it meets another nerve-centre (some ganglionic mass of gray substance) interposed in its course. It seldom, therefore, extends from spinal nerve-tracts into the spinal nerves, or *vice versâ*.

integrity upon their connection with the spinal cord, while the sensory nerve-fibres depend upon their connection with the spinal ganglia.

The degenerative process which was recognized by both Türck and Waller consists in the production of granular cells along the course of the affected nerve-fibres. The unaffected fibres retain their normal appearance, and thus define the diseased bundles so that they can be traced along the spinal cord and peripheral nerves with great accuracy. Türck was enabled by this means to demonstrate for the first time a distinction between the anterior and posterior segments of the lateral column of the spinal cord, which no ordinary dissection could possibly have established. The observations of Türck have been supplemented by those of Goltz, Gull, Flechsig, Meynert, Bourdon, Charcot, and others, who have added much to our knowledge of the situation and functions of the various spinal nerve-tracts.

This digression will enable you to appreciate the grounds which now enable us to speak with a certain degree of positiveness concerning the course of motor nerve-tracts, comprised within the anterior two thirds of the internal capsule of the cerebrum. I designate the limits of the motor fibres of this bundle somewhat definitely, because it is now generally accepted among neurologists that the *posterior one third* of the internal capsule contains *sensory bundles*, while the *remaining two thirds* has a purely *motor* function.

Now, because motor fibres carry centrifugal impulses, it is logical to describe the motor bundles of the internal capsule from the above downward, beginning with an enumeration of the convolutions from which the motor fibres are believed to spring, and tracing the course of these fibres to their connection with the cells of the anterior horns of the

spinal gray matter, while it is customary to reverse the method, in case the sensory fibres, which carry centripetal impulses, are under consideration.

The diagram to which I shall first call your attention was designed by its author to rudely represent the general features of the internal capsule. It is impossible to properly portray all of the more important facts, to which I shall call attention, by any form of schematic drawing; so that the diagram offered, which is most excellent of its kind, cannot

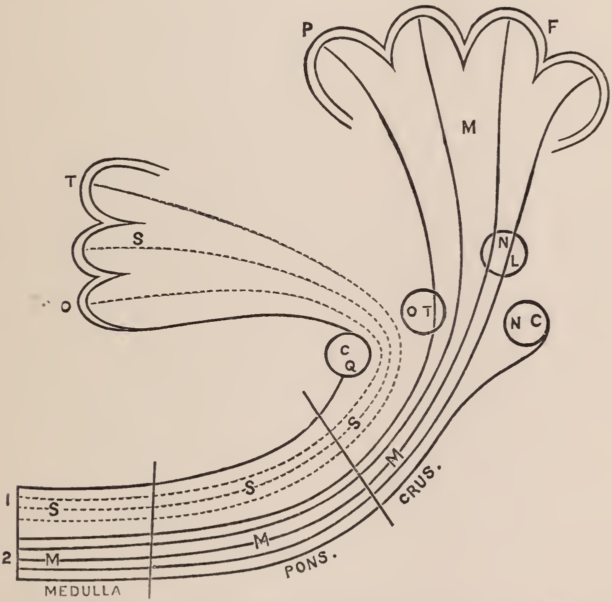

Fig. 3.—Diagram of the Course of Sensory and Motor Tracts in the Mesocephalon and Hemispheres. (Seguin.) S, sensory tract in posterior region of mesocephalon, extending to O and T, occipital, and temporal lobes of hemispheres; M, motor tract in basis cruris, extending to P and F parietal and (part of) frontal lobes of hemispheres; C. Q., corpus quadrigeminum; O. T., optic thalamus; N. L., nucleus lenticularis; N. C., nucleus caudatus; 1, the fibres forming the "tegmentum cruris" (Meynert); 2, the fibres forming the "basis cruris" (Meynert).

more than afford general hints of value, and should be used as a guide only in contrast with more elaborate cuts found in standard anatomical works.

The *motor bundles* arise from the cells of the cerebral cortex comprised within the convolutions of the middle

region of the brain. This region—the so-called "motor district"—includes the *ascending frontal gyrus*, the *basis of the first*, *second*, and *third frontal gyri*, the *ascending parietal gyrus*, the *paracentral lobule*, and the *supra-marginal gyrus*.[1] Some of these bundles pass directly into the substance of the caudate nucleus, some into the lenticular nucleus, and possibly a few into the optic thalamus of the corresponding hemisphere, after traversing the medullary centre of the cerebrum; but the majority appear to be directly continuous with the constricted portion of the internal capsule.

The *sensory fibres* which are comprised within the internal capsule are probably prolonged upward from the posterior parts of the crus (tegmentum cruris cerebri—Fig. 3) to the convolutions of the occipital, temporo-sphenoidal, and parietal lobes. It is believed, however, that the posterior third or (sensory portion) of the internal capsule has connections also, by means of the optic, olfactory, gustatory, and acoustic nerves, with the peripheral organs of special sense. Physiological experiment has shown that, when certain convolutions of the sensory regions of the cerebral cortex have been destroyed in animals, the senses of sight, smell, hearing, and taste have been either temporarily or permanently impaired. We know also that total hemi-anæsthesia results from lesions, both in man as well as animals, which involve the posterior third of the internal capsule. The impairment of special senses from cortical lesions, moreover, appears to be confined to the side opposite to the seat of injury, in case of unilateral destruction of the cerebral convolutions—phenomena which point strongly to a decussation of these fibres, in which respect they bear an analogy to the common sensory tracts. Future consideration will be given to these points. Some

[1] The late work of the author "The Applied Anatomy of the Nervous System," D. Appleton & Co., New York, contains numerous diagrams which illustrate these parts. The term "gyrus" is synonymous with "convolution."

of them, particularly bearing upon the location of an olfactory, optic, and acoustic centre, within the substance of the thalamus, have already been discussed at some length in a previous lecture.[1]

When we discussed the corpus striatum, I constructed for you a diagram which represented the afferent and efferent fibres of that ganglion, in which the motor fibres of the internal capsule were shown. I stated, at that time, that the functions of the caudate and lenticular nuclei were still unsettled, but that anatomical grounds could be advanced to sustain the belief that the cells of both halves of that ganglion exercised a modifying and controlling influence upon motor phenomena, and were probably the seat of automatic action, irrespective of the cells of the cerebral cortex. I stated, also, that it was demonstrable that the cerebellum had a direct connection with the cells of the caudate nucleus, and that physiological experiment pointed strongly to cerebellar innervation of motor acts, because disturbance in coördination of movement are produced by disease of the cerebellum, and motor acts appear to be weakened. Now, because experiments made upon the caudate and lenticular nuclei can hardly be said to have afforded results which can be made the basis for positive deductions respecting the functions of each, it seems highly probable that the cerebellar fibres are in some way connected with those of the internal capsule, which are unquestionably associated with motor phenomena.

Among the afferent fibres of the corpus striatum, in addition to the cerebellar fasciculus (fibres of the *processus cerebelli ad cerebrum*), may be mentioned the "corona radiata," the "stria cornea," fibres from the cortex of the olfactory lobe, and fibres from the septum lucidum.[2] If it

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[1] The reader is referred to a late article by the author upon "The Optic Thalamus," *Journal of Nervous and Mental Disease*, April, 1883.

[2] *Journal of Nervous and Mental Disease*, Jan., 1883.

can be shown that these five sets of afferent nerves become associated with those of the internal capsule, it will help us

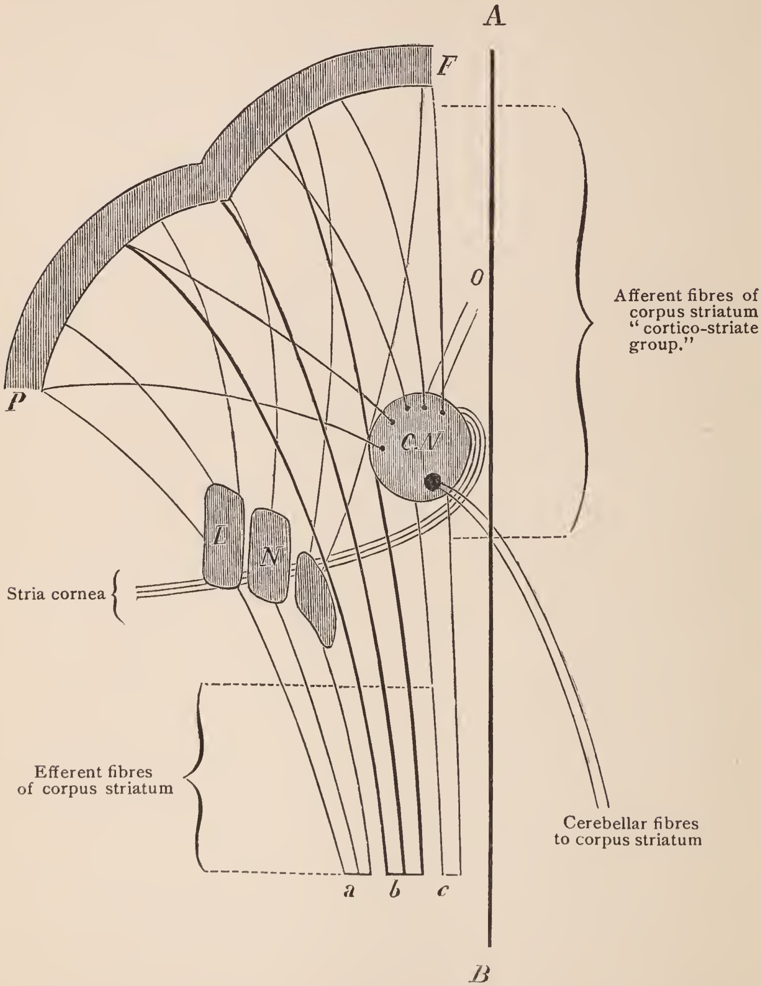

Fig 4.—A Diagram Designed to Show the Afferent and Efferent Fibres of the Corpus Striatum. *C. N.*, "caudate nucleus," or ventricular portion of corpus striatum; *L. N.*, "lenticular nucleus," or extra-ventricular portion of corpus striatum; *A—B*, median line, separating cerebral hemispheres; *P—F*, psycho-motor regions of the cortex; *a*, peduncular fibres connected with *L. N.*; *b*, fibres of the so-called "internal capsule"; *c*, fibres connected with *C. N.*; *O*, olfactory fibres.

to better interpret the functions of the parts. The time has passed when any single experiment can be advanced to

prove the existence of isolated functions within ganglionic masses. Anatomical research has demonstrated that nerve-tracts frequently traverse these masses (without any apparent association with the cells embedded within them) in order to terminate in remote parts. It has been conclusively proven also that special centres are sometimes interspersed between these nerve-bundles, so that it is illogical to attribute every phenomenon caused by an intra-cranial experiment to a disturbance in the activity of any special centre. The physiology of many parts of the brain is far from satisfactorily marked out. Many glaring contradictions are apparently proven by the experiments of different investigators, and the statements previously made will help, to some extent, to explain them. I pointed out, when discussing the structural anatomy of the thalamus,[1] that, until the existence of the special centres, which are believed to exist by some authorities within that ganglion, could be positively demonstrated, it will be maintained by others that many phenomena which accompany lesions of the thalamus are due entirely to *pressure* exerted upon the adjacent internal capsule. This view is held also by many neurologists, when phenomena provoked by any experiment upon the corpus striatum[2] are adduced to prove a special function as located within that ganglion. Pathological research has, in some instances, seemed to oppose the view that the lenticular nucleus possesses any important motor functions. The French experimenters, Franck and Pitres, published in 1878 a most brilliant attempt to demonstrate conclusively that the anterior fibres of the internal capsule were continuous with the motor convolutions of the cerebrum and conducted motor impulses. These physiologists

[1] See *Journal of Nervous and Mental Disease*, April, 1883.

[2] It is possible that the *caudate nucleus*, when seriously impaired by lesions, may cause hemiplegia and secondary degeneration. Charcot claims, however, that the effects of hemorrhage of the corpus striatum are to be attributed entirely to pressure upon the motor fibres of the internal capsule.

found that when the white substance of the cerebral hemisphere, which underlies the motor convolutions, was faradized, muscular movements were created on the opposite side of the body in definite regions corresponding to the supposed action of the so-called "motor centres" of the cortex. It must be confessed by all that these observations, which are considered by many as a final proof of the distribution and function of this bundle of fibres, are among the most satisfactory which have been as yet recorded.

Before we pass to the consideration of the internal capsule in its practical aspects, let us speak a little more definitely in regard to its exact situation and limits. This bundle, as was stated before, lies between the lenticular nucleus on the one side, and the caudate nucleus and the optic thalamus, on the other. Transverse vertical sections of the cerebrum show that the lenticular nucleus lies external to and below it, while the caudate nucleus and thalamus lie internal to and above it (Fig. 2). In the region of the base of the cerebrum, the head of the caudate nucleus becomes fused with the lenticular nucleus, so that the internal capsule does not extend to the extreme anterior limits of these ganglionic masses. The posterior limit of the internal capsule is defined by the termination of the lenticular nucleus; the thalamus being prolonged beyond it into the substance of the cerebral hemisphere. Above the level of the basal ganglia, the fibres of this bundle radiate into the different lobes of the cerebrum (Fig. 3); the anterior part of the frontal lobe, and some portions of the occipital and temporo-sphenoidal lobes, being possibly exempt.

To the naked eye, the fibres of the internal capsule, which pass between the ganglionic masses at the base of the hemisphere, appear to be continuous with the corona radiata above, and the fibres of the crus cerebri below. There is a general belief among anatomists, however, that

successive loops will probably be demonstrated by more extended research—the fibres of the crus leaving the internal capsule to join the cells of the basal ganglia, while others leave the ganglia to pass, by means of the internal capsule, to the cerebral convolutions. The results lately obtained by Franck and Pitres (mentioned on a preceding page), seem, however, to be rather opposed to this view, although they do not positively controvert it.

Effects of Lesions of the Internal Capsule.

The situation of this bundle of nerve-fibres renders it liable to become directly involved when hemorrhage, softening, or tumors of the *central portions* of the hemisphere exist; or, indirectly, when these conditions affect the *caudate nucleus*, the *lenticular nucleus*, or the *optic thalamus*. The most frequent seat of cerebral apoplexy is the corpus striatum; because that ganglion is extremely friable and very vascular. The optic thalamus probably ranks next in the order of comparative frequency. The blood-vessels which enter these bodies[1] through the anterior and posterior perforated spaces at the base of the cerebrum seem to be frequently affected with atheromatous degeneration and miliary aneurisms, and are often ruptured when subjected to any unnatural strain. Nature has given to the carotid and the vertebral arteries a remarkable tortuosity before their entrance into the cavity of the cranium, in order, as it were, to diminish the liability to rupture of blood-vessels by decreasing the velocity of the flow when the heart's action is excessive; but even this mechanical safeguard is not always sufficient to protect the intracranial vessels from rupture when extensively diseased.

[1] The motor regions of the cortex are supplied by the *middle cerebral* artery; the nucleus caudatus by branches of the *anterior cerebral* and *anterior* communicating arteries; the lenticular nucleus by the *middle cerebral;* and the optic thalamus by branches of the *middle* and *posterior cerebral* vessels.

Again, the condition of softening may result from embolic obstruction to some branches of the carotid (usually of the left side)[1] because the nutrition of the parts supplied by the occluded vessel is thus arrested either entirely or in part. The same result may also follow an attack of cerebritis or a previous extravasation of blood into the substance of the brain, both of which tend often to create impairment of the blood-supply to adjacent regions.

Finally, tumors sometimes develop within the cerebral hemispheres, and create pressure upon, as well as destruction of important nerve-tracts. Time will not permit us to enter into detail respecting all the diagnostic points by which the existence of each of these conditions may be recognized during life. I direct your attention, therefore, only to such points as are of importance in the diagnosis of disturbance of the supposed functions of the internal capsule.

It may be stated with some degree of positiveness that, if the anterior two thirds of the internal capsule be affected, a *hemiplegia* of the opposite side is developed.[2] This is more or less complete, according to the seat and extent of the lesion which causes it. The exciting cause may possibly be situated within the anterior or middle portions of the white centre of the cerebral hemisphere, above the level of the basal ganglia, in which case it interferes with the normal action of certain bundles of the internal capsule which spring from the motor convolutions of the cortex previously enumerated. Again, it may be situated within the constricted portion of the capsule, in which case bundles of nerve-fibres, functionally associated with widely diffused

[1] The reasons for this fact can be found in a late work by the author—"Practical Medical Anatomy." Wm. Wood & Co., 1882.

[2] Exceptions to this rule are occasionally observed. The hemiplegia, in rare cases, exists on the same side as the lesion. The explanation of this fact has been shown, by the researches of Flechsig, to lie in the varying proportions of the direct and decussating fibres which pass from the cerebrum to the spinal cord.

areas of the cortex may be affected by a lesion of small size. Finally, it may be apparently confined to the subtance of one of the two nuclei of the corpus striatum (Fig. 5), or the optic thalamus, and still exert sufficient pressure upon the constricted part of the internal capsule to produce more or less extensive and complete paralysis of the opposite lateral half of the body. The hemiplegia of intracerebral lesions forms, as a rule, a striking contrast with the various types of *monoplegia*, which are produced by circumscribed lesions of the cortex. The latter are often of the greatest aid to the neurologist in localizing the seat of the exciting cause.[1]

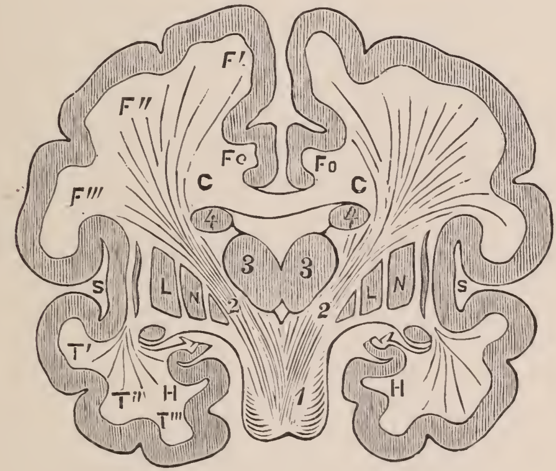

FIG. 5.—A DIAGRAM OF THE BRAIN IN TRANSVERSE VERTICAL SECTION (MODIFIED SLIGHTLY FROM DALTON). 1, crus cerebri; 2, internal capsule; 3, optic thalamus; 4, caudate nucleus; *C. C.*, corpus callosum; *L. N.*, lenticular nucleus; *S*, fissure of Sylvius; *Fo*, gyrus fornicatus; *F′*, *F″*, *F‴*, first, second, and third frontal convolutions; *T′*, *T″*, *T‴*, temporal convolutions; *H*, gyrus hippocampi.

The second symptom which may indicate a lesion of the internal capsule is *hemi-anæsthesia.* By this, I mean a loss of sensation, more or less complete, which is confined to the lateral half of the body. It exists on the side opposite to

[1] The subject of *monoplegia* has been discussed, in all of its clinical aspects, by the author in his work previously referred to. The term covers many forms of paralysis where *special groups* of muscles are alone affected.

the seat of the lesion. This may occur when fibres of the *posterior third* of the internal capsule are destroyed or impaired by diseased conditions directly affecting them, as noted by Charcot, Raymond, Rendu, Ferrier, and others, or by the pressure exerted by lesions situated in parts adjacent to them. It is usually accompanied with a slight form of motor paralysis; probably because a few of the motor fibres of the internal capsule are, as a rule, simultaneously interfered with. The tests by which this condition may be recognized are, doubtless, familiar to you all. They were given you in detail in a previous lecture. No examination is ever complete unless sensation, as well as muscular power, is carefully tested, before a diagnosis is made.

A third symptom of lesions of the internal capsule includes a variety of manifestations of *impairment of the special senses.* In connection with the discussion of the optic thalamus, you will recall the views which I advanced respecting the possibility of existence of special centres of smell, sight, hearing, and sensation within the substance of that ganglion. I have also stated that some clinical facts point strongly to a relationship between nerve-fibres related to certain special-sense perceptions and the internal capsule. It is impossible, with our present knowledge, to definitely place the situation of the cortical centres which preside over the various special senses, or the course of separate fibres which seem to be associated with them, but we are forced to admit that some of the fibres of the posterior part of the internal capsule have a direct or an indirect association with smell, sight, hearing, sensation, and perhaps of taste also. During the last winter's course, I mentioned many interesting facts in physiology, which showed the value of abnormal phenomena in smell, sight, speech, hearing, taste, etc., upon the diagnosis of intracranial

lesions.[1] Many of these might be repeated here with advantage, if time would permit. One peculiar fact cannot be omitted, however, which Charcot has endeavored to explain, viz., that hemianopsia[2] never (?) occurs in connection with lesions of the internal capsule, but an amblyopia is developed on the same side as the cutaneous anæsthesia, with a remarkable contraction of the field of vision and difficulty in discrimination of color. The explanation which this author makes of this fact is, that a second decussation of the fibres of the optic nerve takes place somewhere between the optic chiasm and the internal capsule, probably in the tubercula quadrigemina.

When the radiating fibres of the internal capsule are involved in a lesion which creates a gradually increasing pressure (as in the case of tumors which grow slowly) the *fundus of the eye* exhibits morbid changes in the region of entrance of the optic nerve which are of value in diagnosis. The condition so produced is commonly known as the "choked disc." It is nearly always bilateral, but often most marked in one eye. It may be considered as one of the most positive signs of an extensive intra-cerebral lesion, and especially of tumors of the brain. When the eye is examined with an ophthalmoscope, this condition is characterized by a swollen appearance of the optic nerves, which project appreciably above the level of the surrounding retina; the margin of the disc is either obscured or entirely lost; the arteries appear small, and the veins large and tortuous; finally, small hemorrhagic spots may often be detected in the retina near the margins of the disc. In spite of this condition, the power of vision may be little impaired;

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[1] See "Applied Anatomy of the Nervous System." D. Appleton & Co., N.Y., 1881.

[2] The term "hemiopia" signifies half sight; hemianopsia means a blindness of one half of the retina. The latter is, therefore, the preferable term in this connection.

so that the existence of "choked disc" may be unsuspected unless the ophthalmoscope be used before the diagnosis is considered final. After a number of weeks, and very much longer if a tumor is the exciting cause of the condition, the appearance of the disc changes. An unnatural bluish white color, which denotes atrophic changes, develops; the outline of the disc becomes sharply defined; the retinal vessels become small; and vision becomes markedly interfered with.

In exceptional cases of destruction of the internal capsule, the *sense of smell* has been abolished on the side opposite to the seat of the lesion. This fact requires special consideration, as it has been shown that the centre proper for olfactory perceptions seems to be in the hemisphere of the same side. Meynert claims, however, to have demonstrated the existence of an olfactory chiasm in the region of the anterior commissure, in animals where the bulbs are largely developed; and fibres have been traced in the region of the "subiculum cornu Ammonis," or the tip of the temporo-sphenoidal lobe, which connect the olfactory centres with each other. The experiments of Ferrier tend to disprove the decussation of the olfactory paths in the anterior commissure; so that the question still remains unsettled. The sense of smell is more commonly affected in the nostril of the side which corresponds to the seat of the lesion.[1]

Among the fibres of the internal capsule which are distributed to the temporo-sphenoidal lobe some appear to have some association with the *sense of hearing;* but experimentation upon animals to determine the exact seat of the centres of hearing and the effects of their destruction are exceedingly difficult, because the evidences of impairment of this sense are more or less vague. Ferrier thinks,

[1] Ferrier reports a case where smell and taste were simultaneously abolished by a blow upon the top of the head. Ogle records a similar instance.

however, that the superior temporal convolution is unquestionably connected with acoustic perceptions. The area which he maps out as acoustic in function is quite extensive.

The region of the hippocampus seems to be chiefly connected with *tactile sensibility*, because its destruction has been found to create a total loss of that sense on the opposite side of the body (Ferrier).

As regards *taste*, the results of experimentation upon the monkey tribe seem to point to the lower portion of the middle temporal convolution as the probable seat of the centres which are related to that sense.[1] When this region is subjected to irritation, certain reflex movements of the lips, cheek, and tongue are observed, which seem to point to an excitation of the gustatory sense. Its destruction causes abolition of taste.

We have now considered three of the more prominent symptoms which are produced by lesions of the internal capsule, and I pass to a fourth, which I believe to be of great value in aiding the recognition during life of an extensive and rapidly developing lesion of the white centre of the cerebral hemisphere, viz., *conjugate deviation of the eyes and head.*

When, in connection with rapid softening or an extravasation of blood into the substance of the cerebrum above the level of the basal ganglia, this peculiar symptom is developed (either simultaneously with or following paralysis and coma), the patient's head and eyes will be observed to be turned constantly away from the paralyzed side and toward the side which is the seat of the lesion. Various attempts have been made by late authors to throw discredit upon the clinical significance of this symptom as particu-

[1] This may help to explain the fact that injuries received upon the vertex and occipital protuberance cause, in some instances, an abolition of taste. The temporal lobe being injured by concussion against the adjacent bone.

larly indicative of a lesion of the cerebral hemisphere, but I am convinced that it is a valuable differential sign. Ferrier has demonstrated that a cortical centre, which he locates in the first and second frontal gyri near to their bases, presides over conjugate movements of the head and eyes, and causes dilatation of the pupils. He attributes this symptom, when occurring in connection with hemiplegia of cortical or ganglionic origin, to the unantagonized action of the corresponding centre of the uninjured hemisphere, thus explaining the fact that the distortion is toward the side of the lesion. Clinical evidence of the correctness of this view has been brought forward by Hughlings-Jackson, Priestly Smith, Chouppe, Landouzy, Carroll, and others; and, in some cases reported, the situation of the lesion has been verified by pathological observation. The opportunity to record pathological observations upon cases where this symptom was well marked during life is, unfortunately for science, a comparatively rare one. It is impossible, therefore, to speak positively concerning the diagnostic value of this symptom, although the weight of clinical evidence seems to be strongly in its favor.

A fifth symptom, which points strongly to an existing lesion of the internal capsule, is *choreiform movements* following hemiplegia or hemianæsthesia. These movements vary in type and degree. In some cases, the movements exhibit the peculiarities of athetosis, the fingers or toes being thrown into active motions which cannot be controlled by the patient; in others, true ataxia may be developed; again, the spasmodic movements partake of the character of genuine chorea; finally, a tremor, more or less marked, may be detected.

It is not uncommon to find that both hemiplegia and hemianæsthesia may co-exist with these post-paralytic forms of spasmodic disease; but one usually overshadows the

other, the hemiplegia being, as a rule, the more marked. How we are to explain these late phenomena, is not definitely settled. They are probably to be classed with other morbid manifestations which paralyzed muscles sometimes exhibit, chiefly that of "late rigidity" so often seen, concerning the cause of which many conjectures have been advanced but nothing of a positive nature demonstrated.

Finally, it has been observed that lesions of the internal capsule, if very extensive, are often followed by a very marked *rise in the temperature* of the body. We have yet much to learn concerning the vaso-motor centres which are variously disposed within the substance of the brain and spinal cord.

The fact has been mentioned that the fibres of the internal capsule probably terminate, anteriorly, in the *motor convolutions* of the cerebral cortex. Although there are still some neurologists of note who deny the value of the late attempts of Fritsch, Hitzig, Broca, Ferrier, Charcot, Hughlings-Jackson, Pitres, Landouzy, Exner, Chouppe, and a host of others, to locate special centres within the convolutions of the cortex, clinical and pathological observations are constantly being brought forward in support of the more generally accepted views. The region which embraces these motor centres appears, however, to be somewhat limited. A critical review of recorded cases shows, I think, beyond cavil, that the white centre of each hemisphere of the cerebrum, as well as the cortex, may in some instances, be extensively diseased or injured without any motor or sensory results which can be determined. Pathological evidence seems to demonstrate, however, that the region so impaired must not be situated where the fibres of the internal capsule suffer destruction or pressure if we expect to meet with negative results. Abscesses of immense size have been found in the anterior part of the frontal lobe, as well as in

certain portions of the occipital and temporo-sphenoidal lobes without any sensory or motor paralysis during life to indicate the existence of such a lesion. Tumors, softenings, and the most severe types of traumatism have likewise occurred without creating serious effects.

In case of the occipital and temporo-sphenoidal lobes, to which some of the posterior fibres of the internal capsule are probably distributed, sensory and psychical symptoms have been observed by some to follow circumscribed lesions. A more careful consideration of such cases will perhaps demonstrate the functions of these convolutions more clearly, but at present they are somewhat conjectural. Some forcible arguments have been advanced of late to prove a relationship between the occipital lobes and the mental faculties in opposition to the more commonly accepted doctrine that the frontal lobes were those of intelligence. The temporal lobes seem to exert an influence upon the special senses of touch, smell, and hearing. The angular gyrus of the parietal lobe is probably associated in some way with vision. An apparent connection of the optic and auditory functions with the cerebellum and optic thalamus has been mentioned in previous lectures. The bearing of morbid phenomena of these special senses [1] upon diagnosis will be considered in detail later in the course.

In closing this important subject, let me suggest, that it is by no means certain that lesions, which primarily affect the constricted portion of the internal capsule, may not, in themselves, create sufficient pressure upon the corpus striatum and the optic thalamus to cause interference with the free action of some of the *special centres* which are believed to exist within those bodies. If this be the case, many of the interesting phenomena described during our

[1] The reader is referred to the author's treatise upon nervous anatomy for information respecting these phenomena.

discussion of lesions of the optic thalamus, would *co-exist* with those symptoms of disease within the internal capsule already mentioned. Ritti's views respecting the relations of the optic thalamus to hallucinations, and those of Luys pertaining to its olfactory, optic, and acoustic functions[1] have a special interest in this connection.

[1] *Journal of Nervous and Mental Disease*, April, 1883.

THE PRACTICE OF GYNECOLOGY IN INSTITUTIONS DESIGNED FOR THAT PURPOSE.

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DURING the last decade of years so much has been done and said in regard to gynecology, that one of ordinary capacity has been hurried in trying to keep within sight of the leaders in this department. There has hardly been much breathing-time when we could weigh and measure the real value of the products of this rapidly growing section of science and art.

It is clearly evident, however, that the great achievements in this country have been largely surgical. The operations in gynecology which have been devised by American surgeons have attracted the attention of the profession in the Old World, and have been the means of bringing enterprising students from across the ocean to see our way of doing things. While all this is a source of gratification to us, there is still room for improvement in the general management of diseases of women. It is encouraging to see that there is a marked tendency toward more thorough and comprehensive methods of treating this class of cases. The very fact of this progress in surgery has tended to turn attention to that which is equally important, the general therapeutics of gynecology. It can be easily seen that there is need of an equal blending of the physician's knowledge and the surgeon's skill in managing many of the diseases of women.

The two must go hand in hand in order to do the best that can be done for this class of sufferers. While recognizing the fact that the competent gynecologist of the present time must exercise the function of the physician at the same time that he possesses surgical skill and dexterity, the question naturally arises whether such attainments are manifested by practitioners generally in this special department of our profession. Should the verdict be that surgical skill predominates, as I believe it does, it would be profitable to survey the general field with the view of ascertaining what the tendencies and prospects of the present are. It is far beyond my highest aspirations to settle this point, but still a free expression of opinions often starts trains of thought which lead to more light and clearer comprehension of any subject.

From the little that I have been able to gather from my own investigations, it appears that there is a great fund of valuable knowledge existing in our literature, but much of it is in fragmentary form and in need of classification and arrangement in order to make it available for those who are in search of material to satisfy the demands of every-day practice. Much, I might say most, of the general therapeutics which is of importance to the gynecologist, has been developed by those engaged in other departments of practice, the neurologists having contributed a praiseworthy share.

To group together some of the facts and briefly discuss some of the principles of therapeutics as applied in gynecology, is the chief object which I now have in view. In carrying out this idea, the general management so necessary to success in the surgery of gynecology will naturally come in for brief notice.

To give a basis for that which may be said about therapeutics, it is necessary to outline the constitutional condi-

tions generally found in the various classes of patients which come under the care of the gynecologist.

All such cases may be classed under three heads:

1. Imperfectly developed girls.

2. Invalid wives.

3. Those who suffer from the diseases incident to the climacteric period.

To present this in a form in keeping with the esthetics of the present age, I might say the constitutional diseases incident to the spring, summer, and autumn of woman's procreative age.

In each of the three classes given two well-defined varieties are found. Indeed, many subdivisions might be made and must necessarily be made in the refinements of practice, but for our present purpose two will do, viz.:

Those who suffer from deranged nutrition and general exhaustion resulting from organic disease of the sexual organs, and those who suffer from functional derangements and imaginary ills. Those familiar with these patients will easily recall examples of the three classes and the varieties of each, but in order to make this more clear a word of explanation may be added.

In the young who are imperfectly developed, either in their general organizations, or in their sexual organs, or both, the menstrual function is generally imperfectly performed. This, in time, leads to actual disease of the pelvic organs, which in time tends to derangement of the general health, and finally invalidism. This is more especially the case if to the imperfection of organization be added overtaxation from the cares and duties of ordinary life. In contrast to this variety of class first, we find the well developed who possess at puberty all the requisites for health and functional activity, but because they are placed under deranged

conditions of life, soon become enfeebled and hence develop disease.

Take a young lady capable of much functional activity, mental and physical, and deprive her of the means of physical exercise (as often happens, especially among the wealthy), and deranged nutrition soon follows. Add to this the stimulation of fashionable society, which excites without giving useful employment to use up the nerve-forces, and the system must sooner or later become deranged. Such young women, for want of something better to do, devote much of their time to introspection, and usually succeed in boxing the compass of symptomatology in a very short time. Such are the young ladies who fall into the hands of the gynecologist.

I may dispose of the second class by saying that it is out of this kind of material mentioned in class first, and under such conditions of life, that invalid wives are made.

Regarding the third class, a word only is necessary. If we exclude malignant disease which occurs at the change of life, there are but two varieties which interest the therapeutist, viz., those who suffer from exhaustion and have too much nervous irritability to retire from sexual activity in a graceful way, and those who suffer from excrementitious plethora.

In the general management of the cases now under consideration, the nervous system demands a large share of attention, and happily the resources of our art have been greatly developed in this department within a few years past. No longer ago than the time when I was a student of medicine, assafœtida and valerian were the chief remedies given to nervous women, so called, and if these did not cure them a change of air was advised as a last resort. Now all this is changed for the better, and the progress made has been chiefly through the labors of neurologists. It

does not appear that much has been accomplished by the gynecologists in this direction, except that the most advanced among them have been sagacious enough to take advantage of the therapeutics developed by those interested in the nervous system and its diseases.

On this account it might be well to refer you to works on neurology rather than to discuss this part of my subject. However, it may be well to briefly notice some points in the management of the nervous affections related to gynecology.

The first class given in our classification, viz., those suffering from nervous exhaustion, require rest, and to secure this they must be removed from the cares of life, whether that be the government of a family and household, or the duties of a profession or a business. Isolation is the first thing to be secured, and that for a time is all that is required in some cases. Those who are exhausted without being irritable will rest if they get a chance, but the majority require more than that. Many of those who require extra sleep are sleepless. They ought to be still, but prefer, in fact insist upon keeping on the "go," to obtain relief from the tortures of nervous irritability which appear to be aggravated by repose. Such patients require to be toned down to the point of repose. Quiet surroundings and a nurse who understands her business will do much to effect this, but still medicines are often necessary.

The great difficulty is to get such patients to sleep well without resorting to opium or chloral. In this connection I might modify the saying of Sancho and say: "God bless the men who invented the bromides!" They are a great boon in the management of such cases. This is so well known that I need only add that, in my observations, I have found that it is best to push the bromides carefully, but toward their full and specific effect, and to do this safely,

small doses of nux vomica should be given at the same time. While advocating the liberal use of bromide, I would say it should not be long continued. I rarely continue the use of this drug longer than a week or two, except it may be one dose in the evening to prolong the night's sleep. When bromide is not well borne, or does not give the desired effect, cannabis indica may be tried. Conium also does well and may be combined with camphor, croton chloral, lupulin, belladonna, and the like, but they may all be considered as substitutes to be used in rare cases when the bromides fail. Alcoholic stimulants may be mentioned only to say that, as a rule, they are not well borne. While they may quiet the nervous symptoms for a time, their effect upon the pelvic organs is usually unfavorable, so that what is gained in one direction is lost in the other.

Next to the bromides among nerve sedatives, and perhaps first among them, is massage. The introduction of this treatment into rational therapeutics was a most valuable contribution. It is employed usually to aid nutrition and for this purpose it is of great benefit, but it is an excellent nerve sedative. A skilful nurse can, by systematic manipulation, soothe the tegumentary nerves and produce that normal tiredness which invites rest and sleep. That which used to be the property of ignorant and designing magnetic rubbers is now modified and adapted to rational use. It is a stone which the builders rejected for a time, but now fills an important corner. This massage is true passive exercise, the only way that exercise can be given without exhausting or taxing the nerve-centres. By this means the muscular system can be toned down to the condition adapted to normal rest, and a like effect appears to be produced upon the spinal nerves. This therapeutic agent is of so much importance that reference will be again made to it as we proceed. This part of the subject would be incomplete

without mentioning electricity. That this agent is useful most practitioners will acknowledge. In my own practice I have not been satisfied that it accomplished very much, excepting in the class of cases next to be considered.

Those who suffer from functional derangements of the sexual organs and the nervous system because of imperfect development or misdirected and unoccupied nerve energies; in short, spoiled girls and women, require a very different course of treatment from those just considered. The great object is to find for them mental and physical employment which will turn their attention away from themselves. Here also isolation is an important factor, but it is not for the sake of rest, but change of occupation. To remove such cases from the influence of kind but unwise friends, and place them in the more wholesome society of a nurse and physician, is a great gain. And then their whole time should be profitably occupied. A large portion of the day should be devoted to the Turkish or Roman bath, and if there is a well-defined hysterical element present, the cold pack, shower bath, and needle bath may all be tried in turn. Gymnastic exercise, adapted to the condition of each patient is one of the most valuable means in the management of such cases. If there is any pelvic disease which forbids the use of the ordinary calisthenics, the extremities should be thoroughly exercised while the patient is reclining. There is no one agent so potent in relieving chronic congestion of internal organs as muscular exercise. It is equally efficient in quieting that nervous irritability which is expressed in the host of wandering aches and pains which torment this class of patients. The condition of a brain which has for a long time been wholly occupied in looking after the frailties of the body, can be greatly improved by directing the will-power to the exercise of the muscles. I frequently see women who, because of some

uterine displacement or subacute pelvic cellulitis, are directed to rest in bed without any mental or physical employment. Such imprisonment is sufficient to make an invalid of the best kind of human material. To keep an army in good condition requires constant occupation of officers and men, and this rule applies to many of our sick folks. Our medical literature could well afford to have a chapter on employment for invalids.

After muscular exercise, electricity comes in to fill up time, and is useful to that extent at least. Patients who have some hysterical elements associated with these diseases of their pelvic organs are usually most benefited by electricity. So says Rosenthal in his book on "Diseases of the Nervous System," and my own limited experience agrees with this.

So much, then, may be said about the treatment of the nervous systems, those who are perverted by unfavorable surroundings, but of course the ills of this class are not all imaginary. Some of them, perhaps many of them, are feeble and require medication. Soothing medicines and nerve tonics may all be required and should be employed.

Regarding the third class of cases, viz., those occurring at the change of life, little need be said regarding the nervous system. At the age of forty-five the nervous system has usually accommodated itself to circumstances and is less liable to functional disorders, hence the diseases occurring at the menopause are mostly due to derangements of nutrition, and may, therefore, be considered under that head.

The capricious stomachs of invalid women require much skill and careful treatment in order to make them do their duty. I fully recognize the fact that when the nervous system is quieted and diseases of the sexual organs are

relieved, many of the direct and reflex derangements of the stomach disappear. Still, this is not sufficient in all cases. Indeed, there are few cases which can be successfully managed without giving attention especially to the diet and primary digestion. Want of appetite and labored gastric digestion are the most prominent factors in such cases. Both of these are sometimes due to imperfect secretion of the digestive fluids, as indicated by coating of the tongue, fetor of the breath, and constipation. This may be relieved temporarily by mild laxatives containing blue mass with ipecac. in small doses—mild saline laxatives and the like. In short, the treatment which is best adapted to relieve subacute gastric catarrh answers in the condition now referred to. To excite an appetite in these states is often difficult. The ordinary bitter tinctures often fail to wake up these irritable stomachs to their duty; in fact, they sometimes increase the trouble. The small quantity of alcohol contained in bitter tinctures often disagrees; the extracts which can be given in small doses often answer better. When the irritability of the stomach is marked, bismuth and the oxalate of cerium will sometimes enable the patients to take food when the ordinary stomachics fail. The digestion of food when it can be taken in fair quantities is often labored and slow. Abnormal fermentation often occurs, giving rise to flatulence.

Pepsin, which has been used so freely in such cases, is, I fear, certain only in disappointing those who use it for cases of this kind. Granting that a few grains of pepsin are capable of dissolving so many grains of albumen, the ordinary dose can do little in the way of digesting a good dinner. Theoretically this is true, and my own observations in the practical use of pepsin confirm the theory. Liquor pancreatus promises to be of more value, as it tends to aid the digestive ferments; but we have not had sufficient

experience with it in this country to speak positively regarding it. Perhaps the most important therapeutic means in the management of indigestion is the selection and the administration of food. I have long ago given up the hope of finding any bill of fare which would suit all varieties of dyspeptic women. I now occupy my time in trying to find suitable food for individual cases, and I find that each patient has her own peculiarities. There are a few rules which apply to a number of cases. For example, forced nutrition, as it is called, will answer in treating some of the broken-down nervous women, *i. e.*, giving food in small quantities at short intervals, so that an excess is given in a day. This has become fashionable because of its success in the hands of such men as Weir Mitchell and Alex. Hutchins, but it fails in many cases; at least, I have failed occasionally in the use of this method, and so have others. Dr. J. R. Chadwick, of Boston, in writing to me regarding a case which appeared to require forced feeding, stated that while she took food in large quantities, she lost flesh and strength until he gave up the effort and allowed her to follow her inclinations, and then she improved. Again, some, and in fact the majority, will do better if given food at short intervals, say every two or three hours, even if the whole quantity consumed in a day falls short of the usual quantity taken by a person in health.

From whatever way we view this subject, the chief fact comes up, viz., that we must try all kinds of food and hold fast to that which answers best in each case. To do this, an unlimited supply of provision and a cook full of expedients and plenty of patience are requisite.

At the present time it may be said that the nursing of patients, so far as the selection and administration of food, is generally in advance of the other equally essential factor of nutrition, viz., the demand for food on the part of the

tissues. It is often more difficult to create a demand than to obtain a supply. Primary digestion is often retarded because of imperfect assimilation and elimination. So long as nutrition is sluggish, it is vain to try to improve the appetite and primary digestion and maintain them in good order for any length of time. The tissues generally must be kept in healthful activity in order to keep up the demand for food. Patients who are unable to exercise themselves must be exercised. When the nervous system is incapable of active exertion by reason of disease or exhaustion, extrinsic force must be brought to bear upon the tissues of the body to secure their healthy exercise. For this purpose massage, baths, and electricity should be used. These agents have been spoken of already as sedatives, but their greater value is their power to stimulate ultimate nutrition. By a good vigorous manipulation the nurse does for the patient that which she is unable to do for herself, stimulates the circulation, exercises the muscles, hastens disintegration, and creates the demand for fresh supplies of nutriment, and all this while the nervous system of the patient is enjoying repose. The Turkish bath causes that free elimination which could only be produced by violent exercise, a luxury beyond the reach of a patient with a retroverted uterus and a pair of inflamed ovaries. If to massage and the bath be added a full supply of fluids to keep the kidneys active, and a tonic laxative to keep the bowels regular, if that is necesary, the higher demands in the management of such cases will be fulfilled. There are many other minor demands which can easily be fulfilled by the practitioner in the actual duties of practice which need not be referred to here.

While all these and many other means are being employed to restore the general health, surgical treatment necessary to relieve such local diseases as may exist can be employed to far the best advantage. The highest success can only be

attained by a happy combination of local and general treatment. I hold that the specializing of the several branches of medicine and surgery, which is being developed everywhere in this age, is the highest evidence of true progress. We know that the artisan who devotes his whole attention to a given department of art can acquire a skill which the Jack-of-all-trades can never know. There is, however, a danger of the specialist becoming too circumscribed in his practice. It is possible by long application for one to become profoundly wise in one direction and idiotic in another.

To carry out a systematic course of treatment such as has been briefly referred to here is difficult, wellnigh impossible, in general practice. Granting that one has the requisite medical and surgical knowledge, it is almost impossible to obtain the means necessary. In private practice it is seldom that *proper nursing* can be obtained. There are few who can afford a well-trained nurse for any great length of time, and if that obstacle be overcome the constant interference of relatives and friends thwart the efforts of both physician and nurse to obtain and keep complete control of the patient. Private houses are generally ill-constructed for the care of the sick, and hence much of the doctor's time is lost in treating uterine disease, and the results are unsatisfactory. The time required of both doctor and nurse to care for one isolated patient is equal to that required to care for four if grouped together.

The fact is, that the only way to manage this class of patients with advantage to themselves and satisfaction to the physician, is to treat them in an institution specially arranged for that purpose.

All those who have had experience in the care of those who suffer from disease, other than trivial ailments, know well that they can be better managed in proper institutions than in private houses. This has been demonstrated be-

yond all doubt, and the tendency of the present age appears to be more and more toward the establishment and encouragement of such institutions. If this is true, and I believe it is, we may as well fall in with the current and be among the progressive men in the ranks of the profession.

There is among the people still some prejudice against institutions for the care of the sick, but this arises from the fact that such places have been used in the past for the poor only. The very poverty of such hospitals has often led to misusage in overcrowding, poor feeding, poor nursing, and so on. But the principle of having institutions for the care of the sick is sound. Now that we are beginning to have proper places for the care of the sick, the rich and intelligent are beginning to see the advantages of them. There are certainly good reasons why rich and intelligent parents should send their sons or daughters to institutions for the treatment of disease, or to schools for physical culture. They freely send them to boarding-schools for mental education.

The advantages of such institutions are many. They can be constructed upon the best sanitary principles and adapted to the wants of the sick. The progress in sanitary architecture made in recent times makes it possible to construct a building which will, to a large extent, guard the inmates from the causes of disease which are generated by their own eliminations. Such a building can also be adapted to the requirements and comforts of the sick. A house suited for a family home is not well adapted to the accommodation of patients. The order and government of such a hospital can be made agreeable to the suffering inmates, both as regards quiet and also cleanliness, which includes sewerage and ventilation. Diet also can be regulated according to the laws of health, and made agreeable and tempting to the

capricious appetites of patients. When the sole object of the establishment is to improve the health of those who dwell in them, and where the physician and surgeon and their attendants have the controlling power, a condition of hygiene is secured which is all but impossible in a private family.

In such an establishment the doctor has great advantages. His patients being brought together he can attend a larger number in shorter time. He also has a more perfect control of all their doings. He is within easy call of his surgical cases, and can therefore guard them from accidents and dangers which are liable to occur after operations. I have known severe cases which have been saved by the surgeon of the institution being on hand to promptly arrest hemorrhage. Such cases would surely have died if they had been in their homes and at a distance from the surgeon. This only illustrates a principle which has many ways of application. In this country and in Europe we find that the foremost men among specialists have their private institutions for the care of their patients. That such institutions are successful and advantageous to patients and physician, is a fact beyond all question. That more of them are needed is also a fact, the proof of which is found in another fact, viz., the prosperity of institutions under the care of half-educated men who practically carry out but one idea in the treatment of diseases, like hydropathic establishments, for example. For many years such places have been crowded by invalids in search of health. Rather than waste energy in declaiming against such places, it would be better for the profession to recognize the good that is in them and erect institutions upon proper scientific principles to take the place of those which have for a long time been the only resorts open to responsible sick people.

There is still another argument in favor of such institutions, and that is, the progress in the science and art which has been made in hospitals in the past history of the world. Much of all that is valuable in medicine and surgery has originated in hospitals and charity institutions. The Women's Hospital in New York, for example, has given more to the surgery of gynecology than all the private practitioners in the world. This statement, which is rather sweeping, is not intended to take from the honor due to those who are wholly engaged in private practice. Those who have hospitals at their command have no more brains than those who have not, but the advantages of the one class affords the opportunities of developing new ideas in practice which cannot be obtained in private practice,—at least to the same extent. The history of medicine and surgery abundantly shows that the leaders in our profession have been men who enjoyed the advantage of hospital practice. True, the hospitals in which these men have labored have been charity institutions, many of them poorly adapted to the wants of patients. In fact, at the present time, many of our hospitals are so poor that the physicians and surgeons are hampered in their efforts, and still the results obtained are, in many cases, superior to that obtained in private practice. In our best charity hospitals the patients obtain better chances than the rich do in their luxurious homes. It is now surely true that the rich, or well-to-do people, who are able to pay for proper care when they are sick, should have the advantages which the poor irresponsibles only can command.

This argument may call up the counter-statement that there are dangers in hospitals unknown in private houses. This is true of some hospitals. The crowding together of all kinds of diseases and injuries in rooms that are too small and badly constructed, tends to develop and spread diseases,

but in structures built upon sanitary principles, in which diseases and injuries are properly classified, all these dangers can be avoided.

There are now some important movements on foot to extend the hospital accommodations for the poor. Notably among these is that by Dr. A. Jacobi, who asks the State to give hospitals for poor children suffering from contagious diseases, so that the sick can be well cared for and the well ones protected from contamination. Let me earnestly express the hope that private individuals may be prompted to take steps toward securing such institutions as the more favored classes require.

We have health resorts, so called, where the sick may go in summer and winter, but they are mostly away from the cities and out of the reach of those who most need them. They are also under the control of hotel-keepers, who cannot make their houses to fully suit the demands of the really sick. May we soon have institutions in our cities under the management of responsible members of the medical profession, in which those who need special care can have all that science and art can afford them.

THE EXCRETION OF PHOSPHORIC ACID BY THE KIDNEYS AS AFFECTED BY MENTAL LABOR.*

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THE present note is intended to give the results of a few experiments upon the excretion of phosphoric acid in relation to mental work.

It has seemed to the writer that there is a strong semi-popular or professional opinion that the excretion of phosphoric acid is perceptibly or decidedly increased by mental labor, the most common form in which the statement is made being in regard to the increased elimination of phosphates by clergymen on Mondays. I have not, however, been able to find the statement distinctly made by the original authority, but find it in the works of one who is known as the most elegant of physiological writers and the most scientific of littérateurs, who has assured me that he had authority for his words.

Whether it be based on the statements of Golding-Bird or not I do not know, but if so it does that eminent physiologist much injustice, as he does not speak at all of the elimination of phosphoric acid, but of the deposit of earthy phosphates, and refers to Sunday services not as intellectual labor, but as bodily exertion and anxiety.

The technical difficulties in the way of such an inquiry, if the difference be at all a marked one, are almost none at all,

* Read before the American Neurological Association, June 22, 1883.

since the determination of phosphates with reasonable accuracy is a very simple process, but it is not so easy to make the distinction between mental labor and mental rest a very marked one. Some people seem to consider it a credit to themselves to have been engaged in an intellectual occupation, and are apt to put their habitual pursuit high up in the scale.

I had a young girl in the hospital who claimed that she had exhausted her nervous system in her daily avocation, which proved to be the pasting of labels upon shoes.

I hope I have not fallen into a similar error.

We have no accurate scale for mental labor corresponding to the foot pound of mechanical work done, and it is very obvious that degrees of mental exertion are utterly without correspondence to the value of results obtained. A person unapt in mathematics, for instance, may strive for hours and really spend a large amount of cerebral energy in demonstrating to himself a proposition which to another is a mere axiom, demanding no perceptible effort for its comprehension. The feeling of fatigue, the consciousness of mental effort, is perhaps the only means we possess of estimating intellectual labor, and this, it is evident, may as well result from the adding up of the most meaningless column of figures as from the composition of a sonnet. I have been, on this account, more careful in describing in what my supposed mental avocation consisted during the times for which the excretion of phosphates was determined.

I cannot claim for them any high degree of intensity. My lecturing has been upon subjects, with one exception, familiar to me from many years' repetition, my reading of a more or less routine character, searching for references, etc., but not novels. I have always found myself distinctly tired after my lecture, a feeling which I think is not fully accounted for by my standing during its delivery.

On the other hand, periods of supposed intellectual rest

cannot be made absolutely such. It is impossible to make the mind a perfect vacuum.

A certain admixture of bodily and mental labor also is unavoidable, if any thing like speaking or writing is attempted, and I suppose it might be difficult for one to remain wrapped in intense thought with no outward expression, without being at the same time open to a suspicion that he was in a condition of mere revery or dreaming, rather than of intellectual effort. There are few forms of bodily exercise which are unattended by some sort of intellectual activity, except the most monotonous and unvarying of employments, like work in a treadmill, the turning of a crank, or sawing wood, and if the employment demands no reflection, it is impossible to make sure in the case of even the most stolid and impassible drudge that his thoughts are not employed in some other direction.

So that any observations must be made in reference only to greater and less, and not to the presence or absence of intellectual processes, and the person experimented on can tell better than any one else the degree.

My observations on myself have been made during the latter part of the day, as being more under my own control, and because I could on different days make the conditions of mental labor vary more distinctly than during the morning and early afternoon, when it was difficult for me to know what my occupation was going to be, or how much anxiety or perplexity I should have.

The earlier observations embraced only the time of a lecture and a few hours afterward, but as it might be objected that phosphoric acid was formed during the period of greatest mental labor, but only slowly found its way into the blood and out of the excretory organs, I made a few others in which the phosphoric acid was measured not only for the evening, but for the succeeding night.

In some of these the earthy phosphates were separately

estimated, with the result of giving about the ordinary proportion and showing nothing of special interest.

I do not intend to inflict upon the Society all the figures, but merely to state results. Taking the first series of experiments, where the time covered was *about* two hours, including in a part of them an hour of some sort of medical instruction, reducing all to the uniform standard of two hours *exactly*, and dividing into two sets of work-days and leisure-days respectively, we find that the average amount of phosphoric acid excreted in the two sets is the same within three milligrammes, *i. e.*, .247 in the first set and .250 in the second.

Two observations I did not know where to class. One of these was taken from the time when an emergency lecture was given, at an hour different from that of the others, and which might be considered as involving more than the usual amount of exertion on account of the lesser familiarity of the subject. The quantity of urine and of phosphoric acid was in this instance diminished.

The second was from a time occupied in reading and in attending a reception, and I am unable to say whether there was any mental exertion or not.

In the next experiments, extending over a longer time, the excretion of phosphates was distinctly less during the working afternoon and evening and during the succeeding night than during the corresponding times when as little as possible was done.

It will be seen by these figures that, so far from the phosphates being increased in the urine by mental exertion, they have, in some of my experiments, been rather diminished during the process which I dignify by the name of thought.

Would it be fair from these figures to infer that no phosphorus is used up in the process of cerebration? Certainly not; but they are enough to show that the amount of

phosphates derived from the metamorphosis of brain tissue in the condition of physiological activity is so small, in comparison with that from the system generally, that it has no perceptible effect on the total of phosphates found in the urine.

It is as much out of the question to judge of the amount of phosphates sent from the brain by examining the urine, as it would be to tell whether there had been a thunderstorm in Minnesota by measuring the rise of water at the mouth of the Mississippi.

Is there any reason for a *diminished* secretion as found in certain of my experiments? I believe it may be easily found by noticing the lesser amount of urine secreted on these occasions.

In the condition of concentrated attention it is in accordance with all our ideas of physiological activity that the brain should receive a larger supply of blood and, either directly from the withdrawal of this blood from the kidneys, or, as seems to me more probable, from a change in the blood tension, the pressure in the kidneys, and consequently the amount of urine, be diminished.

I have noticed on other not recorded occasions, that the flow of urine after a lecture, or other exercise demanding close attention, has been quite scanty.

The last two experiments, which are fairly comparable to each other, seem to give results opposed to those obtained before. They, however, no more than counterbalance these, as the summing up of all the experiments together in the form of an average of phosphoric acid secreted per hour, shows a difference between work- (.1153) and leisure-hours (.1157) so small, that the coincidence of the two figures must be looked upon, considering the small number of experiments, as almost accidental.

Exp.	Hour.	Amount.	Phos. Acid.	Amount Per Hour.	Phos. Acid Per Hour.	OCCUPATION.
		cc.	*grammes*	*cc.*	*grammes*	
1	3.35 to 5.40	150	.285	72	.137	Did nothing. Slept.
"	10.35	280	.613	57	.125	Convivial supper.
"	7.30 A.M.	310	——	34	——	
2	3.30 to 5.37	250	.350	118	.165	Writing and reading. Went to fire. Drank considerable water.
3	3.30 to 5.30	100	.230	50	.115	Slept and did nothing. Drank a glass of alkaline water and two glasses of wine.
4	3.35 to 6.15	270	.445	101	.167	Sleeping and driving.
5	3.40 to 6.05	170	.315	070	.130	Driving. Saw a not difficult case in consultation.
6	7.10 to 11.15	98	.404	24	.099	Emergency lecture from 8 to 9. Reading.
7	3.43 to 5.05	114	.345	83	.120	Recitation.
"	6.35	43		29		
8	3.45 to 5.57	106	.328	48	.149	Clinical conference. Examination of urine. Writing.
9	3.45 to 6.03	123	.258	53	.112	Some reading. Some social entertainment.
10	3.45 to 5.20	36	.195	23	.060	Lecture, walk, dinner.
"	7.00	24		14		
11	3.45 to 9.00	205	.400	39	.076	Had taken ether to have carbuncle opened. Afterward asleep.
"	7.55 A.M.	318	.192	29	.109	Driving. Slept very well.
12	3.45 to 6.10	845	.986	51	.147	Lecture, writing, etc. Dinner, writing.
"	7.40	778				Meeting of Med. Imp. Soc. Writing until 10.25.
"	10.27	177				
"	11.30	30	.778	42	.076	Read a little poetry and went to bed. Slept well.
"	6.00	210				Last urine half an hour after breakfast
"	8.45	192				
13	3.47 to 5.55	138	1.109	75	.165	Doing nothing. Dinner. Drive. Very little reading, and but little conversation. No studying.
"	10.29	366				
"	11.35					
		26	.837	24	.081	Bed about 12.
"	8.50	346		37		
14	3.30 to 10.30	230	.943	33	.135	Walk. Reading in library. Dinner. Writing and reading until 10.30. Two glasses of water at dinner.
"	8 A.M.	533	.906	56	.095	Pot. brom. and little bicarb. soda at bed-time. Slept well.
15	3.30 to 10.30	218	.861	31	.123	Reading exam. books. Two or three glasses of wine. Dinner. A little carb. soda. Reading exam. books and writing. Very warm day.
	Night	not	taken.			
16	3.30 to 10.30	402	.824	57	.1175	Reading exam. books. Dinner. A little carb. of soda. Much cooler day.
"	8 A.M.	314	.933	33	.099	
17	3.30 to 10.30	250	.747	35	.1065	Riding and strolling about. Conversation.
"	8 A.M.	214	.640	22	0.67	Dinner and same again. Cool day.

LEISURE-DAYS.			WORK-DAYS.		
Expts.	Amount.	Phos. Acid in two hours of afternoon.	Expts.	Amount.	Phos. Acid in two hours of afternoon, including lecture, etc.
1	144	.274	2	236	.330
3	100	.230	7	166	.240
4	202	.334	8	96	.298
5	140	.260	10	46	.120
11	78	.152			
				4) 544	.988
	5) 664	1.250			
				136	.247
	133	.250			

AVERAGE ELIMINATION OF PHOSPHORIC ACID PER HOUR.

Hours of work and succeeding.	Leisure.
.1153	.1157
Observations.	Observations.
2, 6, 7, 8, 10, 12, 14, 15, 16,	1, 3, 4, 5, 9, 11, 13, 17.

THE EARLY SYMPTOMS OF GENERAL PARALYSIS OF THE INSANE.*

By Dr. W. B. GOLDSMITH,

SUPERINTENDENT OF THE DANVERS LUNATIC HOSPITAL.

AS physician in hospitals for the insane, I have received many cases of general paralysis in which there had been an entire failure to appreciate correctly the, at least, possible import of various symptoms appearing before the unmistakable ones, which failure was sometimes attended with serious injury to the patients or others; for in disorders affecting the organ which controls the individual in his moral obligations, professional duties, social relations, and business transactions, the early recognition even of disease which we are forced to regard as incurable, has more practical importance than exists in disease of other organs, where an early accuracy of diagnosis often simply hastens the "verdict of despair" to the patient without benefiting his fellows; and among the various forms of mental disorder, there is probably none which, in proportion to its frequency, so often before its recognition ruins the laboriously acquired and carefully guarded reputation of a lifetime, or involves relatives in scandal and financial reverses.

This failure of appreciation of early symptoms is probably partly because general paralysis, unlike most other forms of

* A paper read at the annual meeting of the Mass. Med. Soc., June 13, 1883.

disease attended with mental decay, does not usually select its victims from those who have inherited weak and unstable nervous organization, but from the capable and vigorous, in whom no one expects weakness to show itself, and partly because certain mental symptoms are so striking, that we are liable to identify them with the disease, and not recognize it without them.

My remarks are based on an analysis of the histories of one hundred cases, and I think that they possess more accuracy as to fact than the average of such histories, because I have taken the cases of such patients only as had been under the careful observation of friends whom I believe to be intelligent and reliable.

This plan is open to the objection that the facts are largely obtained from non-medical and non-expert observers, but this is a source of error that cannot be avoided in studying mental disease, because the earlier symptoms have usually persisted some time before the case comes to the general practitioner, and still longer before it reaches the specialist, and, as subjective examinations as to previous history cannot be considered reliable, the observation of friends is our only resource; and it may be said in favor of the accuracy of my facts, that friends are much more likely to recall slight changes in a retrospect, and to frankly tell the whole truth concerning mental symptoms when they have become sufficiently marked to render it desirable to send the patient to a hospital, than earlier, when they feel anxious to cover up improprieties and weaknesses. It is also true of these cases, that they were selected at a time when the diagnosis was unmistakable, so that, whatever may be said as to the occurrence of similar nervous symptoms in patients who do not become general paretics, it is undoubtedly true that they were in these patients the warnings of that disease, and my aim is, not so much to record

the symptoms after they have become sufficiently characteristic for a certain diagnosis, as to show what are actual danger signals that should render the physician alert and observing; the recognition and observance of which would, I am sure, prevent much financial loss as well as danger to individuals, and unjust condemnation by legal tribunals and society; and it is reasonable to suppose that the nearer the beginning we start, the more likely we are to prevent the dire ending which we now regard as inevitable. That these signals will be most varied and inconstant follows from the nature of the disease they indicate, as we must remember that there is no variety of nerve-tissue, in the cerebro-spinal or sympathetic system, which has not been proved to suffer degenerative lesion consequent on this disease, or which has not been claimed, with fair assurance of accuracy, to have been the seat of the initial active lesion of its commencement. Lewis has traced the descending degeneration as far as the sciatic nerve, and Westphal and others have described ascending degeneration from lesions of the spinal cord, traumatic and others, while some recent observers think that some cases at least have the origin ascribed to the disease by MM. Poincaré and Bonnet, who, in 1863, found marked changes in the sympathetic ganglia and considered them primary. As this paper is not designed for those who have given special attention to nervous diseases, I will venture to recall the variety of symptoms likely to be present, and I will enumerate them as nearly as possible in what I believe to be their order of frequency. It is a disease always presenting during its course both motor and mental symptoms, which, however, may vary greatly in their character, intensity, and order of appearance. The motor symptoms are always evidences of diminished muscular power or control, and may affect any muscles, but usually do appear first in those groups whose

functions require the greatest harmony and nicest adjustment in action. Hence the common early motor symptoms are defective articulation, tremor of the tongue, tremor of the facial muscles when expressing emotion, irregular chirography, inability to control the hands in such nice movements as are requisite in playing musical instruments, general tremor, inco-ordination or paretic weakness of gait, and occasionally localized clonic spasms, most frequent in the face. Perhaps, too, the seizures which occur sometimes during the history of most cases may best be included with the motor symptoms. These may occur at any time, and may simulate petit mal, grand mal, apoplexy, or have a mixed character rather peculiarly their own.

Of sensory symptoms there may be dysæsthesia, hyperæsthesia, anæsthesia; and, exceptionally, almost any variety of neuralgia.

My experience leads me to regard disorder of the special senses as a rare early symptom and not very frequent later one, but both impaired function and hallucinations of all are reported.

To the sympathetic system probably may properly be charged most of the pupillary changes, which are: inequality, usually shown most strikingly by the failure of one pupil to dilate as readily as the other in moderate light; a marked decrease in the size of both, making sometimes the pin-hole pupil, and sluggishness in action in varying light, in accommodation, and in answer to sensory stimuli. To the vaso-motor control of the sympathetic must also, I think, be ascribed the irregularities in the superficial circulation frequently shown by localized or general flushings, resembling that seen in one accustomed to alcoholics when slightly under their influence. There are other symptoms which cannot well be classified pathologically, but which possess some value for diagnostic purposes; as the condition

of the tendon reflex, which may be not noticeably changed, increased, or absent.

Similar changes of increase or diminution may occur in the skin, cremasteric and sphincter reflexes, but are not often seen until later in the disease.

All known mental symptoms are found with greater or less frequency, those usually considered characteristic being a marked feeling of self-complacency and content, and delusions of wealth, greatness, and power.

Eighty-seven of my one hundred cases were men and thirteen women, but I have not considered them separately except as regards some mental symptoms which seem modified by sex.

The frequency with which each of the various physical symptoms mentioned appeared as the first physical change is as follows:

Some defect of articulation thirty-eight times. The text-books often attempt to enumerate various kinds of articulatory defect that occur in general paralysis, but any such classification is rather incomplete and misleading, as any part of the articulatory apparatus may be chiefly affected and all kinds of disorder occasioned thereby. A hesitancy of speech, recognized best when the patient is quietly conversing, and an occasional elision of a syllable, best recognized when the patient is earnestly conversing, are probably most frequent.

Some form of seizure appeared first twenty times. Thirteen of these seizures resembled closely the convulsions of grand mal, the patient falling to the ground and being generally convulsed, but none of them are known to have given the epileptic cry, and the succeeding coma or stupor was much more pronounced and prolonged than in ordinary epilepsy. Four of this thirteen were sent to the hospital diagnosed simply as cases of epilepsy.

Four of the seizures resembled petit mal, the patients losing consciousness, but having no noticeable convulsion. And three were considered apoplectic attacks, and resembled apoplexy in that the patient fell and remained completely or partially comatose for a time, with little or no convulsive movement. My cases indicate that seizures should have greater prominence as early symptoms than is given them by most authors, but I am unable to say whether they are exceptional in this respect or not.

Tremor of the lips and face was noticed first eight times.

Inco-ordination of gait, ten times.

Diminished sexual power, six times.

General tremor, six times.

Cutaneous numbness and tingling, three times.

Changed chirography, two times.

Dilatation of superficial capillaries and sensation of heat, once.

Dilatation of superficial capillaries and marked hyperidrosis, once (I have seen this same marked hyperidrosis in one other case as a later symptom).

Localized cutaneous hyperæsthesia, once.

General cutaneous hyperæsthesia, once.

Ptosis, external strabismus, and diplopia, once in a syphilitic case.

Diplopia alone, once in a syphilitic case.

Failure of sight from atrophy of the optic nerve, once in a syphilitic case.

Nine of these patients also suffered from decided pain and discomfort in the head previous to other symptoms—it being sufficiently marked in four cases to excite suspicion of brain disease.

There are some other symptoms which may have appeared early and escaped notice, as they are of a character not likely to attract the attention of the non-medical

observer, and I can only give their relative frequency at the time the patients were admitted to the hospital, which was at varying stages of the disease. Thus the patellar-tendon reflex appeared normal in forty-six cases; markedly supra-normal in twenty-four cases; very marked but not necessarily supra-normal in fourteen; very slight but not necessarily below normal in twelve; absent in four.

The number of cases in which it was found supra-normal is comparatively greater, and the number in which it was found slight or absent less, than in those observed by Mickle in England and Westphal in Germany, but corresponds pretty closely with Shaw's observation in this country.

My whole experience, which extends over a larger number of cases than the one hundred mentioned, agrees with the ratios of their figures as to patellar-tendon reflex, and my estimate of its usefulness in diagnosis is as follows: The absence of change does not render the disease improbable.

Well-marked exaggeration in both legs is strong *corroborative* evidence of general paralysis. Diminution or absence of it is decidedly less so, but still has some value.

There has always been disordered gait in the cases where I have seen it absent, and, I have no doubt, tabetic lesion of the cord.

I carefully observed the length of duration of the disease at the time when the examination of the knee jerk was made, but there was no indication of a connection of particular conditions with different stages.

On admission the size of the pupils was unequal in sixteen of my cases, the right being larger in ten, and the left in six. Both pupils were abnormally small in six cases, and both dilated in four. None of these changes seemed more frequent at one stage of the disease than at another.

These figures indicate that inequality of the pupils is not very common, and my own opinion, based on the examina-

tion of other cases, in addition to these, is that its diagnostic importance is usually overrated by the text-books, as its absence has no significance and its presence may be the result of several causes other than general paralysis.

The mental change which appeared first most frequently was failure of capacity. This was true of thirty-six cases, it being chiefly noticeable in nineteen, because of impaired power of memory, and I will venture to remind you that, as this failure is most frequently due to lessened power of attention, the examination should not be concerning events occurring long ago when there was presumably mental integrity, but concerning trivial matters of recent occurrence. Dr. Holmes makes his old man testily refute this imputation of failing memory by saying: "I remember my great-grandma! She 's been dead these sixty years."

And many a general paralytic can give you an accurate history of the events of his previous life long past, when he is unable to tell you where he dined day before yesterday. It is also true that the memory will occasionally assist the patient to conceal failure of reasoning power, as in the case mentioned by Mendel, where the patient answered readily and correctly, that twelve times twelve is 144, but made twelve times thirteen a less number.

In eleven cases the mental failure was evinced by poor judgment in business, without manifest change in activity or habits of life, and in six cases this entailed serious financial reverses on the patient and his family.

In the remaining six cases of mental failure it appeared simply in mental sluggishness, great and unaccustomed disinclination for mental or physical exertion, accompanied in three cases by a striking tendency to sleep.

Marked depression without obvious delusion was noticed first twenty-two times. Marked exhilaration and self satisfaction, seventeen times. This was accompanied by erotism

in nine cases, two of them attempting rape, two indecent familiarities and exposure, and three began an unusual and scandalous course of licentiousness. Several others of this class, before abstemious, became addicted to alcoholic excesses, and attention was attracted to two by thefts which were undoubtedly the outcome of the disease, though not so recognized until the courts had taken action in both cases and one of the men was in prison.

Insane delusions were noticed first twenty-five times. They were the characteristic ones of wealth and greatness in twelve cases.

Six showed a variety of delusions of persecution ; six believed their wives unfaithful, probably chiefly because their erotic desires met repulse, and were dangerous to them thereby ; and one had general delusions, based on hallucinations of hearing.

Măniacal excitement, of extreme intensity, sometimes appeared very rarely in fifteen cases, but was not the first symptom noticed.

The thirteen women exhibited no marked variation from the men in physical symptoms, but the mental symptoms were commonly much less pronounced and active.

Six showed simple dementia. Three had definite delusions that men outraged them ; and two, delusion that some spirit or angel had sexual intercourse with them.

Two had ordinary delusions of persecution. Several of those who had delusions of being outraged thought themselves pregnant, and this is by some observers considered a frequent delusion among female general paralytics. I think that the delusions as to sexual intercourse usually depend on the misinterpretation of an orgasm, experienced at night ; and those of pregnancy, indirectly on the same, or on anomalous sensations in the abdomen.

Three of these women were of very good social position,

and this is a larger proportion than is found abroad, where general paralysis is considered very rare among those having the social rank of ladies.

The relative time of appearance of the two classes of symptoms was as follows : In sixty-eight cases the mental and motor symptoms were noticed at the same time.

In twenty-four, mental symptoms alone first attracted attention ; and in eight, the motor symptoms.

These figures are undoubtedly inaccurate, as slight changes, particularly of a motor character, might readily escape the notice of a non-expert observer, and some motor changes would unquestionably have been observed by an expert in many of the twenty-four cases which are recorded as presenting mental symptoms alone at first, but they do show that much difference of time between the appearance of these two classes of symptoms is exceptional, though it is true that either may show remissions or intermissions early in the disease, so that their existence can only be learned by careful questioning as to the previous history. Thus, one may see a patient laboring under intense maniacal excitement, in whom no motor paresis can be detected, but who has a history of previous convulsive seizures, or attacks of unconsciousness, which change the diagnosis from curable mania to general paralysis. In one of my cases, a woman, marked defect of articulation was for some time regularly present each morning, but disappeared before noon, and it is not at all uncommon to see pronounced symptoms of any kind diminish greatly or disappear, if the patient is changed from excitement and dissipation to a quiet routine of life.

In the few cases where mental symptoms appeared to me to unquestionably precede the physical, they were almost invariably those of marked depression not reaching the grade of positive insanity, and the physical symptom that appeared alone first most frequently was some form of seizure.

Finally, the symptoms presented by these cases appear to me to indicate, with the somewhat moderate weight of authority to which their numbers entitle them :

1st. That the striking and characteristic group of symptoms ascribed to the disease by Calmeil in 1826, and having greatest prominence in most text-books since, is to be found only exceptionally in the cases of to-day at the time when the diagnosis is most important.

2d. That physical and mental symptoms usually appear nearly synchronously, so that the physician has the presence or history of both to aid him when called upon for a diagnosis, and it is probable that most of those who report cases of general paralysis without mental impairment are not sufficiently expert to recognize a moderate degree of dementia.

3d. That their observations agree with those of most writers in making defective articulation the most frequent and characteristic early motor symptom.

4th. That changes in the pupils and disorders of gait are less frequent and have less value in diagnosis than is usually ascribed to them, and that given pupillary changes are no more frequent in one stage of the disease than in another.

5th. That the patellar-tendon reflex is found markedly supra-normal in nearly twenty-five per cent. of general paralytics, and that the presence of this symptom is of strong corroborative value in diagnosis, though its absence has none, and that no peculiar condition of the patellar-tendon reflex can be associated with any given stage of the disease.

6th. That hallucination or impaired function of the special senses is very rare as an early symptom ; hallucination (auditory) having been noticed first in but one case, and impaired vision but once in a syphilitic case. The

diminution in the sense of smell, which Voisin thinks very frequent in the early stages, was not noticed in any of my cases, though it may have been present and escaped attention in some, as slight failure is difficult to recognize.

7th. That it is of great importance in the case of a patient showing mental symptom to inquire carefully for a history of convulsions or loss of consciousness, as these were the first motor symptom in twenty of my cases.

8th. That among mental symptoms the marked exhilaration, with delusions of wealth and greatness, which is usually considered the characteristic mental symptom, is present early in less than one fourth of the cases, and that simple failure of mental capacity and activity, and mental depression are the more frequent first mental changes.

EDITORIAL DEPARTMENT.

AN ADDRESS DELIVERED AT THE COMMENCEMENT OF THE WOMAN'S MEDICAL COLLEGE, OF THE N. Y. INFIRMARY, MAY 30, 1883.

Ladies of the Graduating Class :—When you first honored me with an invitation, I declined, and for a reason well known to you. I think it extremely difficult to find a theme that shall be interesting at once to medical students, and to these assembled friends, who, though much interested in certain students, can be expected to take but little interest in medicine.

Were the devising of graduation exercises entrusted to me, I should not hesitate to borrow from the ceremonies of the antique Eleusinian mysteries, or from those of the mediæval Rosicrucians. For however much the light of common day and of common-sense may have been let in upon the art of medicine, it still remains a mystery, a sacred mystery, to the uninitiated ; that is, to all who have not been submitted to a prescribed discipline.

If, however, I should seek a ceremonial of graduation appropriate, not to the mysterious and difficult nature of the studies you have pursued, but to the arduous personal responsibilities you are about to assume, I might find it in the vigils prescribed to the candidates for knighthood in the Middle Ages. These were required to spend a night in fasting and prayer in a solitary chapel, watching the armor and the scabbarded sword they had not yet been permitted to unsheath. There are so many spiritual resemblances between the duties of an energetic physician and those of a well-armed knight.

"Bound for the wide world past the river,
There to put away all wrong,"—

that we would not be far amiss if we imitated these solemn vigils of his initiation. And were we habituated to the accurate symbolism of a more imaginative age than our own, we should at least take care that the garlands which were offered to you in congratulation, were composed, not of roses, but of thorns. For it is thorns, and not roses, which fitly symbolize the career upon which you have now chosen to enter.

No symbolic or mysterious ritual, however, is likely to be either revived or invented for the graduation of students in medical schools in modern New York. There is, however, a widespread feeling among the Faculty of this School, that the exercises of graduation should be exclusively medical in character; that the examinations should be entirely, or in part, conducted in public, before a medical audience competent to judge of their excellence; that the students should defend their theses; should give evidence of practical conversance with the duties of their profession, by examinations at the bedside of patients. The graduating exercises, in a word, should all be performed by the graduates, and not before them, by some one else. Thus only could they acquire real significance and importance. Thus only, I may add, could they be affiliated to the customs of the great European universities, which, in this, as in other matters, must remain our permanent models. These considerations carry so much weight, that I am happy to believe it not impossible that this *may* be the last public commencement, in the popular sense, ever held by our School. In that case, it would be the last occasion on which the graduates and their non-medical friends could consider together some of the non-medical aspects of their professional career.

Now, in this connection, the topic which most frequently suggests itself at our graduation exercises, is that of the sex of the graduates. Indeed, you are liable to be so much and so frequently reminded that you are women physicians, that you are almost liable to forget that you are, first of all, physicians.

As a rule, I have always advised you to reverse this order; to so saturate and permeate your consciousness with the feeling for medicine, that you would entirely forget that public opinion continued to assign you to a special and, on the whole, inferior class of workers in medicine. Still more have I advised you to forget that, in attempting to become physicians at all, you and —far more than you—your predecessors, have in any way braved public opinion. If it be a new place into which you have entered, it is incumbent upon you to acclimate yourselves as quickly and thoroughly as possible to its atmosphere, and not keep dawdling on the threshold to forever remind yourselves and every one else that you have only just come in. Recently emancipated people are always bores, until they themselves have forgotten all about their emancipation. But those, whose souls are really born free, easily regard the trammels imposed upon them by convention or circumstance as trifling accidents which must necessarily be set aside. They do not dream of glorifying themselves because a barrier has fallen down; if the barrier be an injustice, they know that sooner or later it must fall, and once out of their way they spend no further thought upon it.

There is certainly enough, and far more than enough, in medicine to interest and absorb you, without diverting your attention to questions of your social status, and if you do not find the facts of medicine more interesting than any other facts, you are not fit to be physicians. There are, however, occasions on which it is proper to consider the fact that you still constitute, to a considerable extent, a class. You have, therefore, a certain class of interests, and it is important that you should neither overlook these, nor belittle their real importance. For if medicine, or rather, biological studies in health and disease, be to us the most interesting of all subjects, we must admit that after this, the overthrow of social prejudices, tyrannies, and monopolies is, perhaps, the next most interesting theme that could engage the attention of any one. And of all monopolies, what has ever been more odious than that which has restricted to one half of the human race the advantages of education and the facilities of increased

life which that confers, while the other half of humanity has been forcibly excluded from both?

It is true that this monopoly, like all other class monopolies which ever existed, could be defended at first as a simple expression of a natural order of things, and afterward by all the force of the association of ideas which this original order engendered. Yet there never was a time when the monoply was not self-contradictory and injurious. There was no business reason why women should not have been educated in ancient Athens, for there, education was only designed for refining social intercourse. But, as every one knows, the more respectable and high-toned the woman, the less was she allowed to be taught. There was no family reason why the celibate nuns of the Middle Ages should not have shared in the early movement toward learning which began in the monasteries; but it is certain that they were not so allowed. There is no economic reason why in modern England, with its thronged population of unmarried women dependent on their own exertions, the slightest opposition should have been offered to the opening of a new profession to women as a means of livelihood. But in no part of the civilized world, not even in America, has opposition to women students and practitioners of medicine, been so bitter, so brutal, so densely organized, so versatile in its resources, so multiple in its hypocrisy, as in England.

The more we reflect upon this opposition, the more incomprehensible does it appear. Let it be admitted that, for one reason or another, the mass of women had shown, or rather had appeared to have shown, indifference to learning and to the higher forms of work. Should we not have supposed that every class in the community would have hailed with the liveliest satisfaction the first manifestation of such interest on the part of women? Granted that facts seemed to justify, at least a provisional scepticism, in regard to the ability of women to profit by a professional education in abstruse subjects, why should any one have hesitated to offer the fullest opportunities for the development of their powers and the decision of their individual capacity?

The mass of argument, sarcasm, ridicule, invective, and downright calumny which has been poured out upon the heads of the women who, for the last thirty years, have been trying to study medicine, can only be explained by the constant tendency of all monopolies to strengthen themselves by injustice, as soon as they feel that their exclusive privileges are menaced. The argument most frequently brought to the front is, that the presence of women must lower the prestige of any institution to which they were admitted as co-workers or fellow-students with men. When the London University was debating the question of opening its degrees to women, the medical journals received many letters from former graduates of its medical school, solemnly protesting that such an admission would be a violation of their vested rights,—since it must necessarily lower the value of their diplomas long ago earned and paid for. The same considerations have dominated the action of the Harvard Medical School in this country. In this city a few weeks ago, when a young lady physician had successfully passed a competitive examination for position as interne in one of our hospitals, one of the examiners remarked that he should be opposed to her admission for this reason : there would be no difficulty so long as she held the junior position ; but when, in ordinary course of promotion, she should advance to the higher grades, it was to be feared that new candidates of value would not present themselves for the ensuing vacancy, when they heard that, if successful, they must serve under a woman as a superior officer. Now it happened that at the last examination which had been held at this hospital, the results were so unsatisfactory that all the candidates were rejected. Had this happened after the nomination of the lady in question, —for she was appointed,—how easy it would have been to infer that it was her presence in the hospital which had deterrred suitable candidates from presenting themselves !

There have been but three other occasions on which women have attempted to compete for positions in New York hospitals. On the first, the candidate passed a successful examination, and was admitted without further ado. On the second occasion,

when a vacancy was open at Charity Hospital, the woman candidate was acknowledged to have beaten her competitors, but was then refused the place for which she had worked so hard. On the third occasion, a young lady attempted to come up for an examination which was announced for vacancies in the staff of assistants at the female insane asylum at Blackwell's Island. The Commissioners of Charities promised that she should be considered eligible; but one of the medical examiners deliberately misinformed her as to the date of the examination, so that she could not present herself. The resident superintendent, temporarily in charge, further declared that he should in any case decline to be governed by the results of a competitive examination; that he should appoint whom he chose, and he certainly should not choose a woman.

Now Dr. Tuke, the famous English alienist, who has been studying the organization of insane asylums all over the United States, has expressly declared that the best conditions were invariably found where the female patients of the asylum were under the charge of a resident female physician. Similar testimony comes from every asylum where women physicians have been installed. Nowhere is it more desirable that they should obtain a footing than in the vast bedlams of our city almshouses for the pauper insane. But because a handful of persons in charge happen to dislike what they consider an innovation, all attempts to secure competent female assistants on the islands have so far failed.

Hospitals, as well as universities, belong, of right, to the communities which support them. Nothing can be more absurd than the assumption, almost universally made, that either the trustees who administer such public institutions or, in the case of hospitals, the physicians who visit in them, have the right to monopolize their privileges to the exclusion of any duly qualified citizens. In regard to universities and professional schools, it is well known that this assumption is far from being tacit. Applications for admission have been made by women over and over again, and refused as calmly as if these public institutions were

pieces of private property, upon which intrusion was an impertinence. In regard to hospitals, the question has been much less sharply defined, because as yet few candidates have presented themselves. Few women have had the courage to undergo a long and expensive preparation for an examination, to which, after all, they might at last be pronounced ineligible. No woman has even ventured to apply for a position in the Woman's Hospital, where, if anywhere, it might be presumed that a woman physician should be entitled to a place. It has been stated, I know not on what authority, that in this particular hospital the Board of Lady Managers would peremptorily oppose the admission of women internes, even if they had conquered their place by competitive examination, and had overcome the prejudices of the medical staff. It is very certain that not a member of this Board has ever taken the slightest step toward securing the services of a physician of their own sex for the women under their care, nor toward throwing open the advantages of this hospital to the women physicians who might worthily profit by them.

This practical monopoly of the vast clinical opportunities contained in the hospitals, dispensaries, and city institutions of New York, cannot, however, be made a matter of serious complaint until competent women candidates shall have come forward in greater numbers and with more determination to demand their share of this public property. When the demand is once made, it cannot but make itself heard. When at least half of the hospital population are women, and sometimes a third are children; when female nurses are being trained in large and increasing numbers within the hospital wards, it is absurd to allege that from motives of either delicacy or convenience, female physicians must be excluded. If, in certain hospitals, the existing arrangements are such that a woman interne could not perform all the duties, then the existing arrangements should be modified whenever a woman candidate shall have demonstrated her intrinsic fitness for the place at a competitive examination. There is no good reason why, in such a case, the female wards of the hospital

should not be assigned to the woman interne, the male wards to her masculine coadjutor.

The appointment of women on the staff of visiting physicians to a general hospital is a question that has not yet come up.

This subject of hospital appointments well illustrates the close solidarity of interests which exists between women physicians. It will not do for you to forget this, and to imagine that when you have once secured your several diplomas all your class work ends. It will not do to imagine that devotion to your own individual interests and advancement will suffice to secure even that. You must combine to remove the difficulties which stand in your way as a class, and to which the fortunes of any individual among you are always liable to succumb. The habitual exclusion of women from fit opportunities for preparation or exertion, engenders an habitually low tone of confidence in their abilities, which constantly interferes to prevent any given woman from demonstrating her abilities. We have not yet reached the time when it will be considered as natural for a family to employ a woman physician as a man ; or where the profession of medicine will be as evenly distributed between men and women as is now the profession of teaching. To bring about this state of things requires much effort, individual and collective, persistent, patient, far-sighted, indomitable. The problem involves questions of rights, but is by no means only a question of rights. An inequality must be rectified, and in the teeth of much opposition ; but the most delicate part of the task consists in actually raising to an equality the class which hitherto has been really inferior.

You may contribute to this great work in two ways. In the first place, you should be continually exerting yourselves to increase the educational advantages of the school of which you are alumnæ, and also to extend the opportunities for undergraduate education elsewhere. It is strange how little our graduates have hitherto exerted themselves in this respect. The seventy-five whom we have by this time sent forth from among us, could, if solidly united in purpose, immensely increase the

educational facilities of those who come after them. But it is a short-sighted policy to imagine that the affairs of the school no longer concern you because you will never be obliged to re-enter its undergraduate course. On the contrary, who is to look after them if not you? Why should outsiders, from motives of pure philanthropy, busy themselves with collecting support for institutions and enterprises which should by this time be managed by the collective efforts of the college graduates? There is another kind of educational effort which it is most important for you to make: I mean the continued education of yourselves. It is a commonplace of commencement addresses to remind you that your education is only just begun; that you must continue to study and improve, and so on. I am not speaking however in this general sense, but with reference to a certain peculiarity whose importance has probably not yet impressed you. This is, the remarkable contrast apt to be shown between the energy which women will manifest in obeying authoritative orders for study, and the lack of energy they show in independent initiative. Experience in medical, as in other tuition, has abundantly proved that in every class there is always a fair proportion perfectly capable of learning all that can be taught them. When such students are found insufficiently prepared on any subject, we may justly lay the blame to some defect in the method of teaching. And at present, the method in vogue of teaching the medical sciences is so defective that it is not surprising so many students remain so far below their real capacity of attainment. But under whatever guidance a student is instructed, there comes a time in which he must become his own guide; in which further knowledge must be obtained in obedience to his own consciousness of its interest and necessity; in which further discipline must be self-imposed. And it is precisely here that women students are apt to fail, to stand still, to abandon all definite intellectual purpose, and begin to drift like rudderless ships. When we consider the often enormous efforts and sacrifices made by women to secure opportunities for study and to work their way toward a diploma, it is nothing less than astounding to

notice the intellectual apathy into which so many sink, as soon as the coveted parchment is secured.

Comment on this circumstance may perhaps be deemed inappropriate on this occasion, and a discouraging endorsement of a widespread reproach that has long enough been made to women:

"Yea," said Cyril: "they learn the old things as well as we. But when did women ever yet invent?"

I have, however, a word to add in at least partial explanation. Lack of intellectual initiative is by no means confined to women; it is, in fact, the average condition of the human race. Few, and far between, are the minds sufficiently vitalized, self-reliant, and self-poised, to be able to disengage themselves from hand-to-mouth, every-day necessities and preoccupations, and to pursue an ideal inquiry for its own sake, or for the solitary pleasure of rounding off and completing their stock of knowledge on any given subject. The great mass of intellectual work that is done in the world, is still done in obedience to order; more remote, less direct than that which lays down the curriculum for undergraduate studies, but still an order which emanates from some superior mind, or from the collective intellectual force of the community. This work is being incessantly stimulated by a complex machinery of societies, publications, prizes, places, reputations, innumerable rewards of most varying character, but all consciously or unconsciously directed toward fostering the mental activity of those who would not work without them.

Now, to the extent to which women continue to isolate themselves, or to submit to enforced isolation from this vast current of intellectual life, it is inevitable that their own must become apathetic. All impulse to energy finally comes from without, as all life depends upon the sun. Before, therefore, much stress can be laid on the reproach of lack of initiative in women, it behooves us to consider whether the position in which they now are is one in which mental initiative has ever been developed on a large scale among men. Their position is colonial; and every one knows the singular combination of mental inactivity with intense practical energy, which peculiarly characterizes colonial life.

The disingenuous hostility to women physicians, which has marked every step in our thirty years' struggle,—we may justly call it a Thirty Years' War,—has much abated in regard to the elementary question, whether women should receive legal authority to attend such sick persons as chose to consult them. Fortunately for us, the habit of consulting with reputable women practitioners has been established, some time before the present concession to consultations with homœopaths could have robbed consultations with women of all significance. But the effort to exclude women from the full privileges of the profession still continues ; is manifested in such struggles as that which convulsed the Massachusetts Medical Society at its centennial ; in such resolutions as that which excluded women from the International Congress at London ; in the annual debates over their admission to the British Medical Association ; and in the discussions, of various degrees of acrimony, which are excited by the application of a woman candidate to any medical society where a woman has not yet been admitted.

To overcome all this opposition it is necessary not only to make persistent application to these same societies, but to engage resolutely, and without the aid of their stimulus, in the same work in which they are engaged. Our English colleague, Dr. Frances Hoggan, has always been excluded from the Pathological Society of London. But the original work in histological investigation that she has pursued with her husband in their laboratory at home, has received deserved recognition in the leading journals of France, Germany, and even England. It is the old story of the bricks, to be made without straw ; of the shield to be hammered by the Antwerp artificer, without tools. The task is difficult, extremely difficult, but it is by no means impossible. The important thing is to recognize the necessity for constant definite mental work in definite directions ; and the conditions under which this can be performed. This may not always seem to have any bearing on the practical work you may be at the time engaged in. But you may be very sure that if you attempt nothing but what seems at the time absolutely necessary, you will

always remain wofully below the measure of the needful. In intellectual life it is not altogether a paradox to say, "Give us the luxuries, and we will dispense with the necessaries."

Evidence of a free, self-sustained, self-reliant intellectual activity is justly demanded as proof that a physician is capable of exercising the independent judgment which is absolutely necessary for the handling of the simplest case of disease. You cannot treat the sick by means of folios of precepts, the most precise and accurate that were ever devised. And to be able to modify the precepts which you have been taught as a basis for your self-instruction, your minds must have been trained to inquiry, to independent pursuit of knowledge, to the grouping of facts, to the summing of evidence, to the original observation and suggestion which a free mind pursues as its natural and inevitable occupation. Do not, therefore, continue to justify the old assertion that the only free choice a woman ever really cares to exercise is that of choosing her own master. If you cannot learn to act without masters, you evidently will never become the real equals of those who do.

What a number of distinct and different views of things you must therefore hold steadily before you! You must, on the one hand, forget that any social prejudices stand in your way as physicians: but on the other hand you must remember that, in virtue of these, you continue to have certain class interests, which cannot, with either justice or safety, be ignored. You must remember all that you have been taught; and yet you must soon cease to think of what you have been taught in comparison with what you must freshly learn. At certain times you must be able to sink all immediate practical considerations in the interest of pure ideas. Yet, to the pursuit of these, you must bring a tenacious, practical energy, such as can scarcely be acquired except in conflict with practical emergencies. There is not a detail of your career, theoretical or practical, individual or social, that will not require the highest possible development of your powers of will. This is, indeed, the sovereign power of human nature, without which bright perceptions, good intentions, quick intuitions, flash

only for a moment to vanish in darkness. The beautiful paraphrase of the English poet does not inaptly render the Bible parable :

> " Oh, well for him whose will is strong !
> He suffers, but he will not suffer long ;
> He suffers, but he cannot suffer wrong.
> For him nor moves the loud world's random mock,
> Nor all calamity's hugest waves confound,
> Who seems a promontory of rock,
> That, compassed round with turbulent sound,
> In middle ocean meets the surging shock,
> Tempest-buffeted, citadel-crowned."

M. Putnam Jacobi, M.D.

NEW BOOKS AND INSTRUMENTS.

The Diseases of the Liver, with and without Jaundice, with the Special Application of Physiological Chemistry to their Diagnosis and Treatment. By George Harley, M.D., F.R.S., Fellow of the Royal College of Physicians, Corresponding Member of the Academy of Sciences of Bavaria, Professor in University College, London, etc., etc.

Illustrated by colored plates and wood-engravings. Phila.: P. Blakiston, Son, & Co., 1883.

Did all medical works have the same reason for existing as the work which it is our privilege to pass in review here, only those that would do honor to their authors and credit to science would ask our attention, and the profession would cease to be burdened with a literature in which the authors attempt prematurely what should be left for the termination of their career—the instruction of the medical public. The entire profession has for many years been under obligations to the unceasing and admirable contributions to our scientific knowledge, of which Dr. Harley has been the author. When this authority appears before his audience with a volume of such size, we have reason in advance to expect much. That a careful study of the book should give ample realization to our anticipations, is naturally to be expected. But the book does more than this, it marks for English-speaking authors the epoch which is now about dawning, of the influence which physiological chemistry is to wield upon the future of not only scientific but also of practical medicine.

To some of our readers this latter remark may seem unnecessary, but we feel certain that many among the busy practitioners look upon physiological chemistry as among the theoretical studies; which, it is true, they admit, adds to the scientific attainments of the possessor of such knowledge, but by no means to his ability

to practise the healing art. No error can be more serious. The proper examination of a specimen of urine for albumen requires more care and knowledge than the simple indiscriminate use of nitric acid and heat. And he who continues in this latter procedure fails in arriving at the proper answers necessary to diagnosis in his case.

Dr. Harley in his preface says :

" I may further add, that, as the object of all theory, and the aim of all science, is to insure wise practice, I desire to call special attention to that portion of the work devoted to the physiological chemistry of the excretions, feeling, as I do, that we are entering upon the threshold of an important line of medical inquiry, which, sooner or later, will be followed by valuable practical results. I would also direct the special attention of my readers to the chapter devoted to treatment, as well as that at the end of the book, entitled, Hints on Diagnosis, being sanguine enough to imagine that the adoption of the principles enunciated, regarding the physical and chemical methods of diagnosing diseases of the liver as well as of the modes of action and administration of the remedies usually employed in hepatic affections, may conduce to a more rational and successful method of treating them than has hitherto been employed. I even go so far as to hope that the result of the diagnosis and treatment, as shown in many of the cases cited, will not only justify the adoption of the principles on which they are founded, but also prove a strong incentive to others to follow the physiological-chemical line of investigation I have striven to inculcate."

Further on in his introduction the author again pointedly says : " How long, I ask, are we to find diseases of the liver, even gravely published by otherwise well-educated medical men, as 'cases of functional derangement,' as if they really believed that functional derangement was itself a morbid state, instead of being, as it actually is, a mere symptom of a morbid physical condition of some tangible part or another of the hepatic organ,—its secreting cells, its ducts, its blood-vessels, or nerves ? Have medical men, as a class, yet to learn that nothing in nature happens without a cause ; that no symptom or sign ever originates spontaneously ; that every change in function, no matter however trifling it may be, is invariably preceded by a change in the material organization of some part or other of the tissues inducing it, although we are not always able to detect it ?"

The work begins with a chapter devoted to the chemistry, an-

atomy, and the physiology of the liver. The physical examination is given at more than usual length, and some excellent advice included. The author accepts the generally accepted view of the sugar-forming function of the liver, differing from the more recently expressed view of Pavy, that the liver is a sugar-assimilating, and not a sugar-forming organ. He also lays stress upon the fact that the bile acts principally upon the fatty acids, and less or not at all upon the neutral fats.

Next, the author devotes himself to the etiology of jaundice, giving to its consideration a separate chapter. After alluding to it as only a symptom, the author makes his apologies for devoting so much attention to it, by stating that from its ready recognition it is itself so often accepted as the diagnosis, that a few moments' attention to its etiology will serve to show the difficulties to be encountered in arriving at a proper conclusion as to its significance.

Further on in the work, when the same subject is again taken up, we find the author calling attention to the two great causes of jaundice,—the one obstruction, the other suppression, of the biliary secretion. The author, with ample clinical evidence, shows that jaundice which may at first be obstructive, may, when long continued, belong to the other variety,—that from suppression of the secretion. It is in cases like these that the bile-ducts and passages and gall-bladder are found filled, with pale, whitish, inspissated mucus, which is the simple secretion from the mucous walls.

The succeeding chapter, devoted to the signs and symptoms of jaundice, is intended to call attention to the spurious cases of jaundice, and their diagnostic symptoms. In the concluding lines of the chapter we find the statement : " The crucial test for all spurious forms of jaundice is a very simple one, namely, a naked-eye inspection of the fæces. If the stools be pipe-clay colored, the case may be at once put down as one of jaundice. Dark-colored stools do not negative the idea necessarily, because the presence of blood or medicines may produce the black color. If these two causes for darkening of the fæces can be excluded, then a conclusion is justifiable."

The general treatment of hepatic disorders next claims the author's attention. The statements upon the subject of drugs, upon the kinds of food, upon the nature of the drinks, are terse, pungent, and given with a clearness that proves the author to have no hesitation in recommending what his own valued experience

has shown to be fraught with undoubted good results. In no work could a more readable and satisfactory chapter be met upon the subject of treatment of a disease.

Following this the remaining pages, to quote from the work, are devoted :

"1. To the consideration of all hepatic derangements attended with a yellow discoloration of the skin, due to a temporary or a permanent suppression of the biliary secretion.

"2. To the consideration of hepatic diseases equally associated with yellow skin, but in which the discoloration is due, not to a suppression of secretion, but to an obstruction of the biliary excretion.

"3. To the consideration of hepatic affections with which a yellow skin is neither necessarily nor even so much as usually associated.

"4. To the consideration of hepatic ascites.

"5. To the diagnosis, pathology, and treatment of diseases of the gall-bladder.

" Finally to hints in differential diagnosis and prognosis."

Under the generic heading of biliousness, we find a consideration of three forms—the acute, the subacute, and the chronic biliousness. The differing symptoms of the three forms are succinctly given, as is also the treatment.

Under the heading Intra-uterine, Congenital, and Hereditary Jaundice, the author attacks the variety heretofore called Icterus Neonatorum, demonstrating that in most cases it lacks all the other symptoms of true jaundice except a change in the color of the skin, and that this change is nothing more nor less than a condition dependent upon an impoverished blood state, and should be called by the name he proposes, "Chlorosis Neonatorum." In the previous chapter on the etiology of jaundice, the author has adverted to the fact that, in jaundice from obstruction we have biliverdine circulating in the blood and deposited in the rete of the skin. Now, when devoting himself particularly to jaundice from suppression, he includes all the diseases that produce it under three perfectly distinct classes :

A. Those arising from enervation.

B. Those arising from disordered hepatic circulation.

C. Those arising from absence of secreting substance.

In the subsequent chapters the author pays his respects to the influence of the germs in connection with the subject of epidemic jaundice. We are reminded, or perhaps rather told anew, that

intermittent hæmaturia may, at times, be what it should be designated, a paroxysmal congestive hepatic hæmaturia. In these cases, the author states, the urine, though highly albuminous, usually differs by having a higher specific gravity than in renal albuminuria.

Upon the subject of acute atrophy, the author asserts it to be a mere sporadic form of the contagious jaundice of the tropics; a view in which the author agrees with more recent German writers.

Under the heading of treatment I gladly quote the following, which will serve to remove incorrect impressions left upon the minds of many students by some teachers in medicine:

"At one time it was generally believed that all cases of acute atrophy of the liver were necessarily fatal. Fortunately this is not the case, for in some the violent symptoms gradually disappear, and, as in yellow fever, recovery takes place after free evacuation of the bowels."

In the etiology of the cerebral disturbances in febrile forms of hepatic disease, the author shows himself an ardent supporter of the germ theory. Cerebral derangements in these cases are accounted for by the interference which germs bring about in the oxidative processes of the body. Whereas, cerebral symptoms which accompany the chronic forms of jaundice from obstruction and suppressed secretion, are due to the condition called bilæmia.

Here the author diverges somewhat from the text of his work to devote some pages to the germ etiology of pyrexia in general.

Next we find nearly a hundred instructive pages upon the subject of biliary concretions. With marked emphasis our attention is called to the fact that biliary concretions may be either true gall-stones or else simple plugs of inspissated mucus mixed with some bile, which in some cases may present, when found in the fæces, hard concretions, which may be mistaken for true gall-stones. The symptoms of colic are frequently the same, but the differential diagnosis can often be made, according to the author, by careful inquiry into the previous history of the patient. If found in the fæces their difference in shape, in consistency, and, finally, in composition, are easily determined. The solid constituents of true gall-stones consist of cholesterine, 98., pigment and mucus, 0.50, inorganic salts, 1.25.

The concretions consist of bile pigment, 84.2, cholesterine, 0.6, inorganic salts, 15.2.

Under treatment, the operation of choleo-cystotomy is recom-

mended if indicated, and later on, when speaking of the same subject under the heading of diseases of the gall-bladder, the introduction of the hypodermic needle into the gall-bladder, to be used as a sound for the detection of gall-stones, is referred to. The diagnostic value of the presence or absence, and of the quantity in some cases, of bile acids, melanin, leucin, and tyrosin, uric acid, and urea, is followed out at some length. It would naturally be supposed, from what the author has said at the outset, that here was to be the strength of the author's work. If we were to say that we were disappointed, I fear that we would rank ourselves with those dogmatists who, from the examination of a drop of blood, could determine the habits and constitution of the individual. The results have not thus far been all that may be desired, but the proof is ample that a careful chemical investigation has in some instances established an otherwise impossible diagnosis.

Quite something has indeed been added to our permanent knowledge in this direction, and the way indicated for future work.

Hepatic albuminuria receives some attention—the appearance of albumen and casts in the urine, the supposed result of irritation of the kidneys by biliary matter circulating in the blood.

The subjects of hepatic abscess and cancer are discussed at some length; and the succeeding chapters on fatty liver, hydatids, etc., are treated in the same intelligent manner.

Then at the conclusion follow many pages of hints as to differential diagnosis. As to these latter, we can truly say that they have value; but how great their value will always be determined, as it ever must in questions of differential diagnosis, by the sound sense of the person using them. Dangerous to a tyro, and even though unnecessary at times to the practised diagnostician, they will yet help to clear up many an obscure diagnosis for the skilful physician.

Were our author's fame to rest simply upon this work, we think he could safely entrust it to this book and an appreciative public. As to its dogmatism, we can readily accept the author's excuse in his preface: "In some portions of the volume the statements may, perhaps, appear to be rather dogmatic; if so, I may remind the censorious reader that this has arisen from the circumstance of so many old dogmas and deeply-rooted prejudices having to be combated. For I am quite as alive as he can possibly be to the fact that what one may regard as scientific truth is in no case incontrovertible certitude, and that the deductions of to-day in

an advancing science like that of medicine may require material alteration when viewed in the light of the morrow."

With such a spirit, our author in his work, even at the risk of diffuseness, has everywhere sought to sustain his statements and theories by facts. Throughout its pages are furnished the histories of cases, the results of examination, and no matter how the morrow may deal with some of the author's theories, the medical public must ever remain grateful for an addition and a record of our knowledge of facts that no future can change. Among the classical works upon the subject of which it treats, it must ever hold a foremost rank. [H. N. H.]

A Treatise on Insanity, in its Medical Relations. By Dr. Wm. A. Hammond. New York: D. Appleton & Co.

This is a book of 768 pages; and the first systematic treatise on insanity published in America, although valuable works on insanity have been already published in this country by Rush, Ray, and others.

In the first section the author considers subjects usually placed at the end of most books. Chapter I treats of the nature and seat of the mind, and here he alludes to his paper, published in 1876, entitled "The brain not the sole organ of mind." But as he is about to treat of the diseases of the mind, he is evidently at a loss what to say about those disturbances of the mind which he has suggested are situated in the spinal cord and sympathetic, he is therefore compelled to say, that "though all nervous force partakes more or less of the attributes of that which we call mind, its qualities as exhibited by the force manifested by these latter two organs, as not of such a character, either in health or disease, as to come within the scope of the present treatise. It is with the mind developed by the brain that we have to concern ourselves."

In chapter II the divisions of the mind are disposed of; it is divded into perceptions, the intellect, the emotions, and the will; to make the subject more clear, diagrams composed of circles and lines are introduced.

The subject of the remaining chapters of this section are: chapter III, general remarks on the mental and physical conditions inherent in the individual, which influence the action of the mind; IV, eccentricity; V, idiosyncrasy; VI, genius; VII, habit; VIII, temperament; IX, constitution; X, hereditary tendency; XI, age; XII, sex; XIII, race.

There is nothing specially new in these chapters; they are all treated of in a pleasant half-popular style. Under the chapter on

race, we are not informed if there is any connection between race and the various forms of insanity.

The next section, of two chapters, is devoted to the consideration of the nature and seat of instinct. Section III, of six chapters, treats of sleep and its derangements, made up largely from a monograph by the author on this subject, and published in 1869,

Section IV, composed of thirteen chapters, is on the description and treatment of insanity. In chapter I the various definitions of insanity are given, and a brief description of delusions, hallucinations, and illusions ; far too brief to be satisfactory.

Classification is discussed next; the various methods and plans alluded to. In speaking of the clinical classification, that of Kraft-Ebing is given. "On account of the recognized position of its author, as also of the fact that it is put forth as representing the present state of psychological medicine, I give it entire": but when it is read over, it is found not to be entire, as a large number of the subdivisions given by Kraft-Ebing are left out. Objection is then made to this classification, that it is too full in some respects, and too meagre in others. The author cannot understand why alcoholic insanities are introduced into psychological nosology, and not absinthic, and makes the mistake, undoubtedly an oversight, of saying that Kraft-Ebing does not include circular insanity in his classification ; It will be found that Kraft-Ebing puts it under periodic insanities. The author does not believe that alcoholic insanities should have a place in a classification. He says: "I have not placed such forms as alcoholic mania, malarial mania, podagral mania, and many others of the kind in this classification, for I do not believe that the causes in such cases exercise any influence as a modifier of the type." In this we certainly cannot agree with Dr. Hammond, for the delirium from alcohol is in its terrifying hallucinations, illusions, and delusions, quite peculiar and characteristic. The author's classification is then given, and we cannot do better than reproduce it.

I. Perceptional insanities.
- *a.* Illusions.
- *b.* Hallucinations.

II. Intellectual insanities.
- *a.* Intellectual monomania with exaltation.
- *b.* Intellectual monomania with depression.
- *c.* Chronic intellectual mania.
- *d.* Reasoning mania.
- *e.* Intellectual subjective morbid impulses.
- *f.* Intellectual objective morbid impulses.

III. Emotional insanities.
- *a.* Emotional monomania.
- *b.* Emotional morbid impulses.
- *c.* Simple melancholia.
- *d.* Melancholia with delirium.
- *e.* Melancholia with stupor.
- *f.* Hypochondriacal mania, or melancholia.
- *g.* Hysterical mania.
- *h.* Epidemic insanity.

IV. Volitional insanities.
- *a.* Volitional morbid impulses.
- *b.* Aboulomania (paralysis of the will).

V. Compound insanities.
- *a.* Acute mania.
- *b.* Periodical insanities.
- *c.* Hebephrenia.
- *d.* Circular insanity.
- *e.* Katatonia.
- *f.* Primary dementia.
- *g.* Secondary dementia.
- *h.* Senile dementia.
- *i.* General paralysis.

VI. Constitutional insanities.
- *a.* Epileptic insanity.
- *b.* Puerperal insanity.
- *c.* Pellagrous insanity.
- *d.* Choreic insanity.

VII. Arrests of mental development.
- *a.* Idiocy.
- *b.* Cretinism.

In his preface, Dr. Hammond has expressed the hope that his work and classification will prove of assistance to the student desirous of investigating the phenomena of insanity. I am afraid this hope will not be realized. The classification of Kraft-Ebing is the best one we know of; it is clinical and can be made practical use of, and the student finds that this classification correponds with the clinical types of insanity he meets with. In contrast, Dr. Hammond's classification, as far as we can see, can be of no possible kind of use to the student, but rather tend to confuse him. It appears to be an effort to combine a psychological and clinical classification. In making groups of perceptional, intellectual, emotional, and volitional insanities, it is making

a theoretical class which it is impossible for any one to follow in practice. The disturbances of these mental states are not so isolated that one can make them a basis of classification ; they are all more or less involved in the various types of insanity. We cannot see any reason why hallucinations and illusions should be put down as types of insanity under perceptional insanities ; they are symptoms only of disease, and at times occur without the person being insane. Following on this plan, delusions should have had a place under intellectual insanities. It is to be regretted that the author has not given us a classification that we can make use of in practice.

The great difficulty which the student finds in studying insanity is in making a proper classification ; it is quite possible from his own study of the cases to recognize all the various well-defined clinical types of mental disorder, but when aid is sought from the various English treatises on the subject, the student at once finds himself thrown into confusion. The object of a treatise should be to give just this practical aid in classification and differential diagnosis, and in my opinion no English work, not even Dr. Hammond's, makes this subject clear, but rather confounds the student. Bucknill and Tuke's "Manual of Psychological Medicine," a most excellent work, gives more aid to the student than any one English work I know of. It is not intended by this criticism to convey the idea that English works on insanity are useless to the student. Far from it. What we need in English is a clinical manual on these diseases, similar to that by Professor Kraft-Ebing, which is unquestionably the best modern work on insanity, and he who makes an English translation of it will confer a benefit on the profession.

In treating of diagnosis, or differential diagnosis, the author is still more unsatisfactory than he was on classification. This is a subject upon which we should like to have had a little more information, especially as under katatonia (a condition, by the way, which Prof. Kraft-Ebing does not recognize as a distinct disease) Dr. Hammond quotes a case given by Kraft-Ebing as circular insanity, and asserts that the author has erred in his diagnosis, because, as Dr. Hammond says, it is a typical case of katatonia. We should like very much to have had Dr. H. give us the points in differential diagnosis between this case and those he has previously given under circular insanity.

The thirteenth and last chapter considers the treatment of insanity.

The question of sending a person to an asylum or not is discussed; the moral and hygienic treatment, restraint, non-restraint, and occupation are considered. The medicinal treatment is then taken up. It is well known that the medicinal treatment is rather unsatisfactory, and often has no influence whatever on the disease; and the author appears to be able to give us no new light on the subject; he speaks of a number of medicines, among them bromide of sodium, and the other bromine salts; and it appears that he recommends it in almost every form of mental disturbance, so that it leaves the impression of its being a routine treatment with the author. While speaking of treatment, we are reminded of two cases reported; the one on p. 91, under the chapter on Age, we will quote:

"A boy about six or seven years old; frequently during the day he would experience attacks of acute maniacal excitement, during which he would bite, kick, and strike at all who came near him, and destroy every thing within his power or reach. While the paroxysm was on him he was in constant motion, running and dancing around the room, climbing over the tables and chairs, gesticulating violently, and shouting or talking incoherently at the top of his voice.

"There was some evidence to show that when an infant in arms he had received a fall, striking his head. The place was pointed out differently by his mother and grandmother, but, acting upon what I conceived was the better evidence, I determined to trephine him. The operation was performed with Dr. Hunt's assistance, the cranium being perforated at the right parietal eminence. No injury of the bone was found, but recovery took place immediately, and the patient is now, as I believe, a healthy and sane young man."

We had always supposed that trephining was an operation performed only when there was positive evidence of fracture or depressed bone, and we are somewhat startled by this case and its results. We hope Dr. H. does not intend to have it understood that he recommends trephining insane persons upon such evidence as is presented in the case above.

When this work is considered as a whole, there are many subjects which will convey information to readers. Several mental disorders are described, for the first time in a book of this kind, although not new in periodical literature and monographs. It is well printed, and written in the easy, pleasant manner usual to Dr. Hammond. [J. C. S.]

Insanity, Its Causes and Prevention. By Dr. H. P. Stearns. G. P. Putnam's Sons, N. Y., pp. 248.

When one first takes up this little book, looks at its title, and knowing that Dr. Stearns is the Medical Superintendent of the Retreat for the Insane at Hartford, Conn., it is expected that its perusal will throw some new light on these two important subjects—cause and prevention,—in the history of the insane. But this hope is at once dispelled by a glance at the preface, which informs us that it is a collection of papers read at various times, and now somewhat revised and put in book form for the use of general practitioners, educators, and the more intelligent lay members of society.

The subjects considered are: Chapter 1. Preliminary. 2. Increase of Insanity. 3. Insanity and Civilization. 4. The Insane Diathesis. 5. The Influence of Education. 6. Industrial Education. 7. Moral Education. 8. Heredity. 9. Consanguineous Marriages. 10. Alcohol. 11. Tobacco. 12. Sex in Relation to Insanity. 13. Poverty. 14. Religion. 15. Insufficient Sleep. 16. Conclusions.

This work is intended as an educator of the public more especially, and is to accomplish the same end as the work of Dr. D. Hack Tuke, entitled "Insanity and its Prevention," and similar works.

The author protests against the over-taxing of young children with multitudinous studies which they cannot assimilate, and which are perhaps at best beyond their capacities, and therefore do not aid them in obtaining a living when grown up.

Under the chapter on Industrial Education, what appears to me an important subject is touched upon. From statistics of three insane asylums in two of the Eastern States, showing that from 30 to 42 per cent. of the persons admitted had no industrial occupation, the author argues that so many persons have never been taught in youth any regular occupation, trade, or business. This lack of systematic training of the nervous system in youth, at the present day, as was customary fifty to one hundred years ago, is one of the causes of a certain proportion of those becoming insane. This neglect of industrially educating the young, the author appears to attribute to the change in the methods of conducting business; to the employment of machinery instead of hand labor; the transferring of business trades to large establishments, instead of being done by a man with the aid of his children, thus

training in his craft, at an early age, those who are to follow him as workmen.

The thoughtful, unprofessional reader will find much in this little book to interest and instruct him ; and it is by the appreciation of these various subjects, treated of in this and similar books, by the people at large, that we must eventually hope to derive benefit by the prevention of insanity. [J. C. S.]

ORIGINAL OBSERVATIONS.

AN UNUSUAL HYSTERICAL SYMPTOM-GROUP.*

By Dr. EDWIN WALKER,

PROF. OF DISEASES OF THE NERVOUS SYSTEM IN EVANSVILLE MEDICAL COLLEGE.

There is no disease which presents itself in more varied forms than hysteria. There is scarcely a disease that it does not at some time simulate ; the study of its manifestations, therefore, is of the greatest importance from a diagnostic point of view, for its rarer manifestations are often mistaken for symptoms of some grave disease, and much harm is done by inappropriate treatment. One cannot peruse the cases related in Weir Mitchell's little work on diseases of the nervous system[1] without appreciating the great importance of studying unusual forms of hysterical disease. I wish to relate a case which presented, in the first stage of labor, a group of symptoms closely resembling the premonitory symptoms of puerperal eclampsia.

When I was first called to see Mrs. L., she was eighteen years of age. It was in February, 1880. She had been married the September preceding. She had just had a convulsion, or, as her friends called it, a "spell." It consisted of irregular convulsive movements, not clonic in character, followed by a somnolent condition. She evidently did not lose consciousness, although she claimed she did.

She gave a history of "spells" from early childhood, but their exact character I could not learn. She began to menstruate at twelve years of age, and her paroxysms stopped until October, 1879, the month after her marriage, when they returned, and recurred at each menstrual period.

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* Read before the McDowell Medical Society, May, 1883.

[1] "Lectures on Diseases of the Nervous System, especially in Women." Philadelphia, 1881.

At the time of my visit she had not menstruated for two months. Pregnancy proved to be the cause of the suppression.

I saw her again the next day after the paroxysm, and found complete left hemi-anæsthesia. This fact, together with the emotional character of the patient, the character of the paroxysms, and their connection with the menstrual period, together with her history, made the diagnosis of hysteria gravior quite plain.

It was evidently of quite severe type, from the early date it had appeared and the character of the symptoms. Let me here remind you, for it is often overlooked, that hysteria may exist in children at a very early age; Briquet says that one fifth of all cases begin before the twelfth year.

My patient continued in pretty good condition until the sixth month of her pregnancy, when she lifted a tub of water and ruptured the membranes, and a small amount of amniotic fluid escaped. After rest in bed the fluid would cease to flow, but would commence again on any unusual exertion. So she continued until the eighth month, when a large discharge took place and labor pains set in.

For three days she remained in bed, having occasional pains, but made no material progress. On the third day she began suddenly to complain of severe headache, and in a short time afterward said she was blind. This alarmed her friends, and I was summoned in haste. Her blindness certainly seemed real; I watched her very closely, and tried a number of ways to throw her off her guard, for I suspected shamming, but discovered nothing to warrant the suspicion. The pupils were neither dilated nor contracted, and responded sluggishly to light. An ophthalmoscopic examination was made with negative result. She did not flinch from the light from the mirror.

Hysterical amblyopia is mentioned by Charcot, Jolly, and others. True blindness, doubtless, does occur, but it is usually in but one eye, rarely in both. The results of ophthalmoscopic examinations have been for the most part negative, but Charcot's pupils found congestion of the optic papilla with œdema of its border in some cases. Whether Mrs. L. was one of these cases or was really shamming, is not a matter of special import to us in this connection. She said she was blind, and not being able to disprove it, we were compelled to consider the symptom in making our diagnosis. She had passed only a few ounces of urine in the preceding twenty-four hours. Here then was a patient in the first stage of labor, taken suddenly with pain in the head, and following it

complete loss of vision, and with a scanty flow of urine. Certainly these are symptoms which would immediately suggest impending puerperal convulsions.

Had I been unacquainted with the patient it is more than probable I would have considered it such, without further investigation. It was only by a careful consideration of the symptoms that my doubts were removed, for an hysterical patient may have puerperal convulsions.

Her temperature was 37.° C. Pulse and respirations normal; the urine contained no albumen, nor was there any œdema; these, taken together with the history, were the points from which the diagnosis was made. She recovered her sight in twelve hours.

I am unable to find in the standard works, either of obstetrics or diseases of the nervous system, any mention of the liability of confounding hysteria with the premonitory symptoms of puerperal eclampsia; the liability of confounding the convulsions themselves is briefly alluded to by Cazeaux (p. 804).

All authors on midwifery I have consulted (Leishman, Lusk, Cazeaux, etc.) mention headache, disturbances of vision, and scanty flow of urine as the more prominent premonitory symptoms of puerperal eclampsia. These were all present in our case.

The points of difference are as follows:

HYSTERIA.	PUERPURAL ECLAMPSIA.
History of hysterical attacks.	History of œdema of face, or extremities, and labia majora.
Mental state—emotional.	Mental state—irritable.
Urine may be scanty; no albumen or casts.	Urine scanty; albumen and casts.
Temperature normal.	Temperature sub-normal.
Pulse normal.	Pulse slow and hard.
Pupils normal.	Pupils contracted.
Headache general.	Headache confined to one side, or small area.

It may not be out of place to speak of the subsequent history and treatment of this case. She was safely delivered a few days after the attack referred to in this paper; she made a good recovery, and has never had an hysterical attack since that time. Now as to treatment. I explained the exact nature of the trouble to her husband, who is quite an intelligent man. I told him that when she complained, to pay but little attention to her; if she had any nervous manifestation, to treat it as a matter of no importance,

and under no circumstances to call in the neighboring women. I then told her that her troubles were entirely nervous in character, and explained to her that she could often control herself if she would.

I think that the essential mental trouble in hysteria is deficiency of will-power, with an abnormal craving for sympathy. Hysterical patients are often quite intelligent and can be made to understand their mental bias, and some of them can be induced to cultivate will-power. Whenever my patient seemed to be depressed or more nervous than usual, I would give tonics or sedatives as the condition required, but would always give her distinctly to understand that medicines were only of secondary import, and to be used only when occasion required. I further instructed her to keep busy at something, so that her mind would be diverted from herself. As I have said, she has not had any hysterical attacks since the one detailed in this paper, and has given up many of her emotional habits, crying, complaining, etc.

Had this woman been drugged with nauseous medicines, and been taught to rely on sedatives, the hysterical habit would have doubtless been so engrafted on her, that she would never have shaken it off. I say "hysterical habit," because many of the troublesome manifestations of hysteria become confirmed by repetition. For example : A nervous woman becomes worried from some domestic trouble ; she has an hysterical convulsion ; it produces a consternation in the house ; she is condoled and sympathized with. This is repeated with like result. Finally the woman loses the power to control herself, and every annoyance brings on an attack. An intelligent treatment at the start will often save much trouble.

TWO CASES OF HYSTERIA.

1, HYSTERICAL HEMIANÆSTHESIA IN A MAN, FOLLOWING INJURY ; 2, HYSTERICAL ANÆSTHESIA OF SPECIAL SENSE, ACCOMPANYING CUTANEOUS HYPERÆSTHESIA.*

By G. L. WALTON, M.D.,
BOSTON.

The cases here reported, both under treatment in the department for diseases of the nervous system, at the Massachusetts General Hospital, were kindly referred to me for investigation by Dr. Putnam.

The first case, interesting chiefly on account of its etiology, was that of a fireman, with no history of nervous trouble previous to an

* A paper presented at the meeting of the American Neurological Association, June 22, 1882.

accident which took place a few months ago, since which time, among other nervous symptoms, has appeared a typical hysterical hemianæsthesia.

The patient, C. W., aged fifty-five years, who has always been a robust, healthy man, was riding on his engine last November, when it was overturned, throwing him violently to the ground. He was taken up unconscious, and found to be severely bruised over the right side, including the shoulder and hip. He soon recovered consciousness and was taken home. He says that for some time afterward he had little use of the right arm and leg, and was confined to his bed over six weeks. Since that time he has suffered from a variety of nervous symptoms, including great pain in the back, loss of sexual desire, impairment of emotional control and power of concentration.

Examination, five months after the accident, revealed a condition corresponding to his statement, with the addition of a dejected look, and a tendency for the eyes to fill with tears while describing his symptoms. The patient, a large man with fine muscular development, walked, at this time, with a decided limp, and found the use of the right leg attended with severe pain in the hip, which did not, however, occur spontaneously, or only to a slight degree. There was a stiffness of the arms, and an impairment of motion, both voluntary and passive, at the right scapulo-humeral joint; and pain on forced movements, also to some extent occurring spontaneously, especially at night (periarthritis).

Careful examination failed to reveal paralysis or atrophy of muscles, although the general strength on the right was impaired.

All forms of sensation were lessened over the whole body, much more markedly on the right side to the median line. A pin could be thrust through a fold of skin in most parts of the right arm and leg without causing pain. The punctures made in this way bled scarcely at all.

Sight.—There existed a concentric contraction of the field of vision on both sides, much greater on the right. The color-sense was unimpaired on the left, but with the right eye the patient had difficulty in distinguishing yellow and green. Examination of the fundus (made by Dr. Wadsworth) revealed nothing abnormal. Patient had hypermetropia of one dioptric. The visual acuity, normal on the left, was quite defective on the right, amounting only to about one tenth.

Hearing.—The watch (heard normally at 60–80 centimetres) was heard on the left at 30 centimetres, on the right only on con-

tact. The tuning-fork placed on the bone before the ear was heard plainly on the left, both with the ear open and closed, better with it closed. On the right it was heard faintly with the ear open, and scarcely at all with it closed. Placed on the teeth the tuning-fork was heard only on the left whether the ears were open or closed. The different tones of the scale were heard equally well, and all tones as high as C^{iv} (4,428 v. s.) ; no examination was made at this time for very high tones.

Examination of the ears (after the removal of an accumulation of cerumen on the right) showed both membranes opaque, thickened, and indrawn (otitis media chronica). Both Eustachian tubes were permeable, though the Politzer air-douche produced no sensation on the right. The hearing in the right ear was practically unaffected by the removal of the cerumen.

Taste and *smell* were wanting on the right, not materially affected on the left.

The poles of a large electro-magnet were applied to the right forearm, so as almost to touch the skin. Before the application, only forcible pressure was perceived over this region ; after thirty minutes, the lightest touch was readily felt with the eyes closed. There was no transfer of the anæsthesia to the corresponding part on the other side, nor to any other part of the body.

The same magnet was applied to the right ear for twenty minutes, at the end of which time the lightest touch was perceived at any part of the concha or meatus, regions in which the anæsthesia before the application was especially noted. The patient was surprised to find that he could feel the touch of his own left hand to his right ear, which he had been unable to do before. At this time the tuning-fork applied to the teeth was plainly heard on both sides, whether the ears were open or closed. The watch, heard on the right before the application only on contact, was heard after it at a distance of 10 ctm. There was no transfer of the deafness to the other ear. The anæsthesia, general and special, returned in a few hours.

A few days later the same magnet was again applied to the right ear under the same conditions, excepting that the current was not passing, a fact of which the patient was ignorant. At the end of thirty minutes no change had occurred. The current was then allowed to pass, and in twenty minutes the anæsthesia, general and special, disappeared as before.

The patient's condition has gradually improved under galvanization and cold douches to the spine. The adhesions at the shoulder

were broken up under ether, since which operation massage, galvanization, and passive movement have been applied with benefit. Seven weeks after the commencement of treatment the general sensibility was normal on the left, much improved on the right; the retraction of the field of vision had disappeared from both sides; the patient could hear the watch at twelve centimetres, right; and the tuning-fork placed on the teeth was heard on the right as well as on the left, though not so plainly. That the hearing for high tones had been lost is shown by the fact that at this time the Konigs rod of 20,000 vibrations was unheard in the right, while that of 35,000 was plainly heard in the left ear.[1] Motion was fairly good, excepting as restricted mechanically at the shoulder and hips. The general condition of the patient was also greatly improved, and the emotional and despondent element had for the most part disappeared.

The leading symptoms of this case have already been reported in connection with another case of hemianæsthesia following injury, and attention has been called by Dr. Putnam, who reported them, to the fact that all the objective hysterical symptoms should be carefully sought for in cases of railway and similar injuries, inasmuch as wherever found they furnish tangible evidence of the utmost value.

The peculiar feature in the second case is the occurrence of anæsthesia of the special senses, combined with hyperæsthesia of the integument over the corresponding regions.

The patient, E. S., is a Portuguese girl, aged sixteen, a hair-worker, unmarried. No history of nervous trouble in the family is to be elicited. The patient states that she herself was always well until she came to this country, about one year ago. Before that time menstruation was free and painless; since that time it has been scanty and painful, though regular. Four months ago the left breast began to be painful and tender. The sensitiveness increased, and spread gradually to the back, head, and left arm. About three months ago she had an attack of unconsciousness following fright, and lasting two hours. No other distinct history of hysterical attack of any sort can be made out, although she is said to have had convulsive movements of the left arm. Patient is highly emotional, and is said to cry often.

[1] Since sending this paper for publication, the hearing for high tones has improved so far that the rod of 30,000 vibrations is heard in the right ear, establishing the diagnosis of functional anæsthesia of the auditory nervous apparatus, and at the same time illustrating the value of the high-tone test in questions of diagnosis, a point elsewhere alluded to by the writer.

The patient is well nourished and well developed. Examination reveals extreme hyperæsthesia on the left, extending over the trunk, head, and arm. The hyperæsthetic tract is bounded sharply by the median line on the chest, back, face, and head, and extends downward to a line commencing behind at about the level of the tenth rib and passing directly around the body to the median line in front. The whole surface of the left arm is involved to a line about eight centimetres above the wrist, leaving the sensibility of the hand and wrist normal. The lightest touch over this entire region causes a grimace, and moderate pressure elicits a cry of pain. The breast is especially sensitive, but presents nothing abnormal in form or consistence; both breasts are large and pendulous. The patient complains of spontaneous pain in the left side, which comes on in paroxysms.

Sight.—There is concentric retraction of the field of vision on the left to about 15°. On this side blue is the only color distinguished, red being called black, and green and yellow, white. Hypermetropia of one dioptric exists on both sides. The vision, left, is $\frac{1}{5}$; right, $\frac{6}{5}$. Examination of the fundus (made by Dr. Wadsworth) reveals nothing abnormal on either side.

Hearing.—The patient hears the watch on the right at 90 cm.; on the left neither watch, voice, nor tuning-fork by the air, and neither watch nor tuning-fork by the bone. The tuning-fork placed on the teeth or forehead is heard only on the right, even when the left ear is closed, a procedure which, as is well known, intensifies the sound conveyed by the bone when the nervous auditory apparatus is unaffected.

Examination of the membranes shows nothing abnormal.

The senses of *taste* and *smell*, normal on the right, are wanting on the left.

The electro-magnet was applied to the breast several times for periods of thirty minutes, with negative result. Where it was applied to the arm a slight decrease of sensitiveness appeared in twenty minutes.

A few days after the first examination the left hand became hyperæsthetic; also the front of the left knee just inside the patella. After twenty minutes' application of the magnet to each of these points the hyperæsthesia disappeared without transfer, leaving the sensibility of the knee normal as well as that of the hand and wrist to the previous line on the forearm. This relief of hyperæsthesia was permanent; at least the sensitiveness had not returned after a lapse of several weeks.

A few days after the appearance and disappearance of the hyperæsthesia on the left hand and knee, it appeared on the right trunk, covering exactly the corresponding region to that originally involved on the left side, excepting that the face, neck, and scalp were unaffected. The special senses on the right remained unaltered. This hyperæsthesia has persisted as well as that on the left, and the condition of the patient is otherwise the same now, after a period of four weeks, as when at first examined.

This case presents a marked exception to the rule that anæsthesia of the special senses accompanies that of the integument covering the organs of special sense. The rule, here deviated from is so constant that Féré has offered the suggestion, that there exist somewhere in the brain tracts which preside over both special sensibility and the sensibility of the integument covering the respective organs of special sense.

The writer has had opportunity to examine nineteen cases of hysterical anæsthesia of special sense ; and has, until this case, met with no exception to the rule. Even in those cases in which deafness, *e. g.*, coexisted with normal sensibility of the concha, careful examination has shown anæsthesia of the deeper portion of the external auditory meatus. In this case the opposite condition obtained, the integument over all the organs of special sense on the affected side being hyperæsthetic, as well as the tongue and cornea.

Although the deviation from the rule is so marked in this particular, the fact is still noticeable that the special senses remained unaffected on the right, even after the hyperæsthesia had extended to that side, so long as the general sensibility of the face and ear remained normal.

With regard to the diagnosis in these cases, if further proof than the physical examination were required to confirm it, the experiments with the magnet would have sufficed, whether the magnetism or the imagination is credited with effecting the change in sensibility. The fact that the anæsthesia in the first case yielded to the magnet when the current was passing, and persisted when it was shut off, represents the series of experiments upon which the supposition is founded by Charcot and others, that magnetism as such is an æsthesiogenous agent. It is true that diversion of anæsthesia has been in some cases brought about by a false magnet, as for example in a case witnessed by the writer in Westphal's clinic. Such cases do not, however, as pointed out by Charcot, prove that magnetism is inert, but merely that in very susceptible cases, the imagination may also act as an æsthesioge-

nous agent. A case like ours, in which the false magnet fails when circumstances are most favorable for the imagination (the patient having previously experienced the effect of the true magnet), is certainly a powerful positive argument for the effect of magnetism.

The disturbances of vision peculiar to hysteria, and ilustrated in a typical manner in these two cases, have long been made the subject of careful study, but the investigation of the auditory function in this disease is of so recent date that it may not be out of place to recapitulate the results of the writer's study on this subject,[1] undertaken at the suggestion of Professor Charcot.

Deafness generally accompanies anæsthesia of the integument of the ear, or at least that of the deep parts of the external auditory meàtus and the membrana tympani; the latter being shown not only by the failure to perceive the touch of the probe, but also by the inability to feel the entrance of air on insufflation through the Eustachian tube. The deafness corresponds, as a rule, with the degree of general anæsthesia.

When the latter is *complete*, *i. e.*, with loss of all varieties of sensation, the deafness is also complete, no sound being heard either through the air or by the bone. This degree of deafness is illustrated by the second case here reported, although cutaneous anæsthesia is replaced by hyperæsthesia.

When the general anæsthesia is *incomplete*,—for example, with analgesia and partial loss of the sensations of pressure, temperature, etc., the deafness is also incomplete, following, however, definite rules. The hearing through the bone disappears first in such cases, and in some is entirely wanting, while the hearing by the air is perfect, as in the case of one girl, who heard the watch on the affected side at a distance of over a metre, while the loudest tuning-fork, vibrating in contact with the skull, was only perceived on the other side. The high tones disappear before the middle and low, as in the case of a patient who could hear no tuning-fork above E''' (1315.8 vibrations).

The deafness in hysteria is quite analogous to that in old age, in which the hearing by the bone, and that for high tones, disappears first. It has been said that the conductibility of the bone for sonorous vibrations lessens in old age; this is, however, improbable, the more reasonable supposition being that, when the cerebral centres become dulled, either by age or by hysteria, those sounds disappear first which normally make the least impression

[1] "Deafness in Hysterical Hemianæsthesia," *Brain*, No. 20, 1883. See also "Verhandlung der Physiologischen Gesellschaft zu Berlin," Feb. 9, 1883.

on the auditory nerve, among which sounds must be numbered not only high tones, but also sounds conveyed by the bone.

In diagnosticating hysterical deafness, lesions of the ear itself rarely offer difficulties, inasmuch as they are commonly situated in the middle or external ear (catarrh, cerumen) and are thus generally of such a nature as to intensify, rather than diminish, the sounds conveyed by the bone. The usual ease of diagnosis is illustrated in the first case here reported, in which, notwithstanding the accumulation of cerumen and the chronic catarrh of the middle ear, the vibrations of the tuning-fork, conveyed by the bone, were not heard at all on the anæsthetic side, a fact which made it at once extremely probable that nervous deafness was added to that of mechanical origin.

That the loss of hearing through the bone was due to hysteria, rather than through the advanced age of the patient, was already evident from the fact that it was unilateral, and confirmed by the fact that it disappeared temporarily under the use of the magnet, and permanently on the convalescence of the patient.

ARCHIVES OF MEDICINE.

Original Articles.

A CONTRIBUTION TO THE STUDY OF ICTERUS NEONATORUM.

By FREDERICK P. HENRY, M.D.,
PHILADELPHIA.

THE following observations were made with the object of throwing further light upon the pathology of icterus neonatorum, and more particularly to determine the question of its hæmic or hepatic origin.

By the term icterus neonatorum I mean a discoloration of the skin, appearing from two to five days after birth, varying in hue from a slight sallowness to a decided yellow, disappearing gradually in about two weeks, and unattended by any marked symptoms of constitutional disturbance. In the milder cases the urine does not contain bile pigment, at least in sufficient quantity to stain the child's clothing, while in the more pronounced cases the napkins are decidedly stained by it. This definition excludes all cases of congenital imperfection of the biliary passages, all inflammatory affections of the liver, and gastro-duodenal catarrh; in a word, all cases of jaundice by obstruction. This being the case, it remains to consider whether there is any other form of mechanical jaundice than that by obstruction, and, if so, whether icterus neonatorum can be classed under it.

A few words are here necessary as to the classification of jaundice from the point of view of its etiology.

I.—*The mechanical or hepatogenic form.*

This is universally recognized, in so far as it is produced by any agency increasing the pressure in the bile ducts, and thereby favoring the entrance of the bile into the lymph- and blood-vessels. The converse of this, namely, that icterus may be caused by diminished blood-pressure in the portal vein, is by no means so generally acknowledged. Pylethrombosis, which is sometimes brought forward as a typical cause of the latter form of jaundice, is so in a theoretical sense only, for it is extremely doubtful whether such thrombosis is ever primary.

The occurrence of jaundice in fasting animals has been attributed to diminished blood-pressure in the portal vein, due to enfeebled action of the heart, and, therefore, classed under the head of hepatogenic or mechanical jaundice; but there is quite as good reason for classifying such cases under the head of hæmatogenic jaundice, for in them a rapid diminution in the number of the red blood cells can be demonstrated, while the diminished portal pressure is only inferential.

II.—*Hæmatogenic or chemical jaundice.*

Opinions are divided as to the existence of a form of jaundice in which the abnormal hue of the tissues is derived directly from the coloring matter of the blood. Nevertheless, there is very convincing evidence, both experimental and clinical, to be adduced in support of such a variety of the disease. For example, the injection into the veins of substances which are known to disintegrate the red blood cells, is followed by jaundice. The simplest of these substances is water. The red blood cells, when submitted to the action of water outside of the body, lose their coloring matter; and corresponding with this observation is the fact that injection of water in considerable quantity into the

veins, is followed by jaundice. The same result is produced by the vapors of chloroform and ether when brought in contact with blood contained in a gas chamber; and jaundice occasionally, though it must be admitted very rarely, follows prolonged anæsthesia by these agents in the human subject.

The jaundice of acute phosphorus poisoning, of malarial hæmaturia, and that occurring after the bites of venomous reptiles, is probably hæmatogenic; although in the first-mentioned variety, owing to the fact that phosphorus is an irritant to the gastro-duodenal mucous membrane, it is the opinion of some that the jaundice is hepatogenic or mechanical. In a case of acute phosphorus poisoning, which was recently under my care at the Episcopal Hospital, there was an intense degree of icterus; nevertheless, at the autopsy the gall-bladder was found empty, which would certainly not have been the case had the jaundice been of mechanical origin.

III.—*Jaundice by suppression.*

Harley is the most prominent advocate of such a variety of icterus. He considers that the bile pigment, like cholesterin, is preformed in the blood, and is merely separated by the liver. E. Wagner[1] regards the opinion that there is such a form of jaundice as no longer tenable, and refers to experiments upon the removal of the liver by Müller, Kunde, and Moleschott. The question may be regarded as still open, although the advocates of this form of icterus will probably admit that there are two forms of jaundice by suppression; one in which the accumulation of pigment is due to imperfect action of the liver, therefore *hepatogenic;* another in which more pigment is formed in the blood than can be separated by even a healthy liver, therefore

[1] "Manual of General Pathology," Am. ed., p. 557.

hæmatogenic. The advantage, therefore, of this supposed variety is by no means apparent.

From the foregoing remarks it is, I trust, manifest that I hold to the division of cases of jaundice into hepatogenic or mechanical and hæmatogenic or chemical, and believe that further study will settle either the exclusive or, at least, the preponderating influence of one or other of these causes in every case of icterus.

To produce experimentally the first of these two forms of icterus, it would be necessary to increase the bile-pressure *absolutely* by ligature of the hepatic or common bile-duct, or to increase it *relatively* by cutting off a portion of the portal blood-supply. Now, this latter experiment is performed in the case of every human being by ligature of the umbilical cord. The portal blood-pressure is suddenly and markedly diminished; abnormal conditions of osmosis are established, and when jaundice ensues it is only necessary to prove that the number of the pigment-carriers, *i. e.*, the red blood cells, has not been reduced, in order to settle the question of the mechanical origin of icterus neonatorum.

This is what I have done, by counting the blood cells in a few new-born children, and because, so far as I can ascertain, it has never before been done; there is scarcely an affection of which the etiological status is more uncertain.[1]

The following observations were made at the Maternity Hospital[2] in the autumn of 1881.

CASE I.—Oct. 19, 1881. Alice K., born at 8 A.M. Count made at 10:30 A.M. The child was of average size and not cyanosed. Labor had been natural and easy. No symptoms of suspended animation. Child crying lustily when born. Weight, 8¼

[1] I refer, of course, to counting the blood cells in the neonatus with especial reference to the cause of icterus neonatorum, although unaware of its having been done for any purpose.

[2] Formerly called the State Hospital for Women and Infants. For the opportunity of making these observations, I am indebted to the courtesy of the officials of the institution, and particularly to Dr. J. V. Ingham.

lbs. The blood was obtained by puncture of the great toe, and was venous-looking. (The average number of red blood cells per cubic millimetre is, in the adult, *at least* 5,000,000.)

Number of red cells per cubic mm., 6,410,000.

No white in specimen examined.

Oct. 20th, 10:30 A.M. Second count in the same case. Child thriving.

Number of red cells per cubic mm., 5,810,000.

Oct. 22d. Third count in the case of Alice K. Child doing well; no appearance of jaundice.

Number of red cells per cubic mm., 5,680,000.

The above case proves that a rapid and great diminution in the number of the red blood cells may occur during the first few days after birth, without the supervention of jaundice. That this diminution in the number of cells per cubic mm. was not caused by the absorption of water, is proved by the following facts: The child before birth is suspended in the amniotic fluid, and therefore in a condition far more favorable to the absorption and retention of water in the system than after its removal from the body of the mother. During the examinations of the blood, the only fluid ingested by this infant was that obtained from its mother's breasts, and this, the colostrum, was of small amount. On the other hand, water passed freely out of the system through the kidneys and skin, so that the conditions were eminently favorable to the production of an increased percentage of blood cells, a kind of spurious plethora, through diminution in the normal amount of water in the blood. Nevertheless, the percentage of red blood cells was reduced, and therefore they must have been destroyed.

CASE 2.—John G., born Oct. 20th, at 12 (mid-day). Labor easy and natural. Child not asphyxiated; weight, 8 lbs. Count No. 1 made at 11 A.M., Oct. 21st.

Number red cells per cubic mm., 5,925,000.

This count corresponds closely with count No. 2, in case No. 1, which was made about the same time after birth.

Count No. 2, Oct. 23rd.
Number red cells per cubic mm., 5,520,000.
Faint yellowish tint of skin.
Count No. 3, Oct. 25th.
Number red cells per cubic mm., 4,870,000.
Child deeply jaundiced.

CASE 3.—Mary C., born 5:20 A.M., Nov. 5th. Count made at 2:30 P.M., Nov. 6th. Child weighed 6¾ lbs. at birth. Labor natural.
Number red cells per cubic mm., 3,625,000.
Proportion of white cells to red, 1 to 145.

This case was undoubtedly one of *congenital anæmia*. The child's only appearance of mal-nutrition was a shrivelled state of the integuments of the feet and a less rosy color of the skin than normal. For a new-born child it was decidedly pale. This shrivelled state of the skin emphatically negatives the idea of a relative anæmia from excess of fluid. The blood was probably deficient in quantity (oligæmia) as well as defective in quality (oligocythæmia). There was also a decided increase in the number of the white cells. Careful inquiry proved that there had been no hemorrhage from the cord. As possibly bearing upon the congenital imperfection of this child, I may mention the facts that the parents were themselves immature—the father being seventeen and the mother eighteen years old. But one examination could be obtained in this interesting case, and therefore it has but a remote bearing upon my subject. I introduce it for its own inherent interest.

CASE 4.—Wm. S., born Nov. 6th, 5 A.M.; weight, 6½ lbs.
Count No. 1, Nov. 7th. Number red cells per cubic mm., 4,520,000.
White cells to red, 1 to 904.
Count No. 2, Nov. 8th, 11 A.M. Number red cells per cubic mm., 5,335,000.
White cells to red, 1 to 711.
Child slightly yellow.

Case 5.—Sela F., female, born Nov. 17th, 8:15 A.M.; weight, 7 lbs.; labor rapid and natural ; child healthy-looking.

Count No. 1, Nov. 19th, 10:30 A.M.
Number red cells per cubic mm., 5,185,000.
Number white cells to red, 1 to 350.
Count No, 2, Nov. 21st, 4 P.M.
Number red cells per cubic mm., 5,495,000.
Number white cells to red, 1 to 628.
Slight icteric hue of skin.

From the foregoing observations no argument can be advanced in favor of the hæmatogenic origin of icterus neonatorum ; for while it is true that in case 2, the only one in which there was marked jaundice, this condition coincided with a rapid and great diminution of red cells, it is also true that in case 1 there was a very decided loss in red cells without the occurrence of jaundice, and that in cases 4 and 5, with a slight degree of icterus there was an increase in the number of red cells.

The next questions which naturally arise in connection with this subject are : If this icterus is not hæmatogenic, why does it not invariably occur, since the umbilical vein is ligatured in all new-born infants, and why has the statement been made and corroborated by excellent observers, that it is more frequently met with in delicate children than in the robust ?

I admit both of the facts implied in the above questions, and propose the following explanation :

The degree of immediate interference with the portal circulation produced by ligature of the umbilical cord, depends both upon the anastomoses of the umbilical vein with the veins of the abdominal wall, and upon the vigor of the cardiac contractions. Where there is free anastomosis and a vigorous heart, the intravascular blood-pressure in the hepatic lobules may be maintained to such an extent as to prevent the absorption of bile, and *vice versâ*. I may here

mention, as bearing upon this subject, that the size of the heart, which in the adult is as 1 to 160, in the fœtus is as 1 to 120. This preponderance of cardiac force in the new-born child is a provision of nature for the establishment of new circulatory channels, rendered necessary by the ligature of the cord and the beginning of respiration.

Facts are not wanting to show that the umbilical vein often continues pervious through life, but it is to be regretted that they are not given with more attention to detail. Thierfelder states that it continues patulous in "most human beings." Bamberger has "frequently found the umbilical vein in adults pervious to a fine sound"; and Hoffmann has reported a case of cirrhosis, in which he demonstrated an anastomosis between the greatly dilated umbilical vein and the inferior epigastric. In cases of cirrhosis, a patulous condition of the umbilical vein and anastomoses with veins of the abdominal wall, may, through the establishment of a reverse venous current, be in a high degree conservative.

It is true that Sappey has denied that a vein frequently found in the ligamentum teres is identical with the umbilical vein, but there can be no doubt regarding the case of Hoffmann, for he traced the vessel to its communication in the transverse fissure with the portal vein, and through the open ductus venosus, with the vena cava inferior.[1]

As an instance of the confusion attending the subject of icterus neonatorum, I may mention, that while one set of observers attribute its causation to the sudden diminution of blood-pressure in the hepatic vessels produced by ligature of the cord, Dr. West [2] states that "in many instances of it the fœtal passages are still pervious, and the blood

[1] For reference to cases of patulous umbilical vein, see *Ziemssen's Cyclopædia*, Am. ed., vol. ix, p. 185.

[2] "Lectures on the Diseases of Infancy and Childhood."

circulates in part through channels which ought to have been closed from the time of birth."

The knowledge that the umbilical vein continues pervious in "many instances" of icterus, can only have been obtained by means of autopsies, and it is to be regretted that the general statement is not supported by some particular facts. Since none such are given, I am not inclined to accept it.

For the umbilical vein to continue pervious after ligature of the cord, there must be anastomoses with veins of the abdominal wall, and in order that this collateral venous circulation be at once established, there must be a certain degree of vigor on the part of the heart. Where one or other of these factors is wanting, thrombosis will occur in the vein, and, therefore, the unsupported statement that the umbilical vein continues pervious in many instances of icterus, is opposed to the undoubted fact that the affection is most common in weakly infants.

In my argument I, of course, assume that the current of blood in the umbilical vein, when this remains patulous after birth, is, as before, toward the liver. This, although not susceptible of proof, is much more reasonable than to suppose a reversed current, as in cases of cirrhosis.

In cases in which the umbilical vein does not remain permanently patulous, the usual period of its obliteration may be prolonged, owing to the above-mentioned anastomoses, and this more gradual obliteration may prevent the occurrence of this form of mechanical jaundice.

The fact of varying degrees of icterus neonatorum, harmonizes completely with the theory of a venous anastomosis more or less extensive, and a cardiac contraction more or less powerful; while on the theory of a hæmatogenic icterus, it is impossible to explain why, of new-born children under precisely similar conditions, some should be the victims of a blood dyscrasia, whose only sign or symptom is a discolora-

tion of the skin, while others should present nothing of the sort.

As to the frequency of icterus neonatorum, opinions vary from the one extreme of denying its existence to the other of believing that it is more or less present in all new-born children, its lighter grades escaping detection because they are not carefully looked for. I cannot concur in this latter opinion. While it is true that there are none so blind as they who will not see, it is also true that the willingness to see is at least as productive of positive results as is the unwillingness to see, of negative. Leaving the will, however, out of the question, it is undoubtedly the case that icterus neonatorum is far more common than is generally supposed.

Harley does not consider the affection a form of jaundice at all, and objects strenuously to the term icterus neonatorum, which he calls a "learnedly sounding name," and proposes for it that of *chlorosis* neonatorum, which, to the ear of the writer, has quite as learned a sound, and conveys impressions concerning the pathology of the affection which are not substantiated by a single fact.

The known fact that the portal blood-pressure is suddenly diminished by ligature of the umbilical cord, and the further facts recorded above as to the number of the blood globules in the neonatus, lead me to the conclusion that icterus neonatorum is of the mechanical or hepatogenic form, and that the term chlorosis neonatorum, proposed by Harley for this affection, is a misnomer.

SOME POINTS ON THE MECHANICS OF THE HIP-JOINT IN REGARD TO THE TREATMENT OF MORBUS COXARIUS.

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THE femur is a bent lever, and its motions are: adduction, flexion, abduction, extension, inrotation, outrotation, and circumduction. These motions are caused by muscular contraction. When one set of muscles that span the hip-joint contracts, the femur is moved, and there is also pressure, or stress, on the hip-joint surfaces. The pressure on the joint surfaces in the adult may be as great as 2,000 pounds, and will be proportionally less than this in early life.

In this place the following proposition may be made: Two sets of muscles, that are antagonistic, are more nearly in equilibrium, when the bone that they move cuts the arc of their motion nearer its end on the side of the more powerful set of muscles. For instance, when the forearm is somewhat more than semiflexed, its flexors and extensors are more nearly in equilibrium than when the forearm is in any other position. Again, for instance, when the leg is not quite semiflexed, its flexors and extensors are more nearly in equilibrium than when the leg is in any other position. When the knee-joint and the elbow-joint are injured or diseased, if the limbs are left to themselves, the leg and the forearm will tend more and more in the direction of flexion. For a similar reason, in a case of injury

or disease of the hip-joint, there will be a tendency to flexion and abduction of the thigh.

It is important, in connection with the above proposition, to note, that the femur may be adducted from a line parallel with the long axis of the body about thirty degrees; that it may be abducted from the same line about thirty degrees; that it may be extended somewhat beyond the same line; and that it may be flexed till the thigh comes in contact with the abdomen. The names of the different groups of muscles that span the hip-joint and move the femur need not now be enumerated.

Also, it is important to note, that when the lower limb is measured from the superior anterior spine of the ilium, adduction of the lower limb makes it measure longer, abduction of the lower limb makes it measure shorter, extension of the lower limb make it measure longer, and flexion of the lower limb makes it measure shorter. When the pelvis is tilted upward, adduction of the lower limb takes place; when the pelvis is tilted downward, abduction of the lower limb takes place; when the pelvis is tilted forward, flexion of the lower limb takes place; and when the pelvis is tilted backward, extension of the lower limb takes place. The effects are the same whether we move the thigh or tilt the pelvis.

Now let me ask the following question: What will be the effect of flexion of the thigh on the muscles that move the thigh? All those muscles whose points of origin are in front of the femoral head will have their origins and insertions brought nearer together, and will therefore be shortened. Again, let me ask: What will be the effect of abduction of the thigh on the muscles that move the thigh? All those muscles whose points of origin are external to the femoral head will have their origins and insertions brought nearer together, and will therefore be shortened. This

group of muscles is very powerful, and includes the sartorius.

If, then, we somewhat flex the lower limb, and at the same time slightly abduct it, we shall put the thigh in such an attitude, as to bring the points of origin and insertion of the greater number and of the strongest muscles of the hip-joint nearer together, and put the opposing muscles more nearly in equilibrium. In order to accomplish this desirable result in a case of *morbus coxarius:* Let us put our patient on a bed whose foot-end is somewhat elevated, so as to make the weight of the body cause counter-extension; raise the head and upper part of the body somewhat by means of a pillow, so as to gently flex the lower limb; and put adhesive extending straps on the lower limb, adding the effect of a moderate weight, so as to tilt the pelvis and abduct the thigh. And when this has been done, another condition will supervene, which will be seen to be important: the lower limb will be outrotated. The inrotators of the lower limb will be somewhat relaxed by the flexion above noted, and that will diminish the muscular antagonism to outrotation, and the extension applied to the lower limb will tend to cause outrotation, and at the same time aid in causing the inrotators and outrotators of the thigh to be in a state of equilibrium.

Now what do we actually find in a recent case of *morbus coxarius?* We find the pelvis on the side of the disease tilted downward, and the lower limb on that side abducted; and we also find the limb on the side of the disease outrotated and somewhat flexed. So that the facts agree with the theory: and the explanation of the facts is consonant with the reasons for the theory. While it is not proposed to separate the joint-surfaces in a case of *morbus coxarius*, it is competent and salutary to diminish the pressure of one of these surfaces on the other.

In this place let me compare the weight of the body and the dynamic effect of the contraction of the muscles that span the hip-joint. In the case of a patient weighing sixty-five pounds, it can be shown, that the action of the psoas and iliac muscles, as they flex the thigh, can press the femoral head against the acetabular surface with a force equal to eighty-five pounds, so that the flexion and suspension of the lower limb, during the act of locomotion,may compress the joint surfaces more strongly than the simple superincumbent weight of the body. If now we add to this dynamic condition the fact, that the body is kept upright, as it rests on the femoral head, by means of the contraction of the muscles that span the hip-joint, the pelvis acting as a lever of the first order, we shall readily see how greatly the pressure on the joint-surfaces will be augmented. In fact, the muscles that span the hip-joint, as a part of a neuro-muscular apparatus, in a case of *morbus coxarius*, are competent to apply to the joint-surfaces a pressure of from one hundred to a thousand pounds. And inasmuch as the inflamed tissues of the hip-joint may set in motion the neuro-muscular apparatus at any time, they may receive the detrimental effects of exaggerated muscular contraction.

Now, in a case of *morbus coxarius*, it is impossible to remove all pressure from the surfaces of the hip-joint, and if it were possible, it would not be good practice. The surfaces of the hip-joint and the subjacent tissues were made to operate under certain dynamic conditions; they have a special mechanical environment. The normal state of these tissues is only attainable when their molecular structure is under the normal stress—or, as we say, pressure —of the healthy contraction of their environing and moving muscles. Exaggeration of muscular action and want of muscular action will both tend to be detrimental. Sup-

pose, by way of illustration, the surgeon were to remove the normal pressure of the atmosphere from an inflamed surface, there would be no difficulty in appreciating the effect. And that effect would be very suggestive in regard to the effect of the entire removal of pressure from the joint-surfaces in a case of *morbus coxarius*.

Now, what is the condition of the structures under consideration? Some of the tissues of the joint are irritated; the nerves which communicate with these tissues are also irritated; the muscles which communicate with these nerves are irritated; and these muscles, as they span the hip-joint, are induced to contract in an exaggerated way. The result is, that the inflamed structures have lost their proper and normal adjustment to their neuro-muscular environment. In the meantime, it may be said that the irritation which has caused the inflammation, and disturbed the molecular and mechanical conditions and relations of the hip and its joint, may have had a constitutional or a local origin: we are not now discussing this question. But we may be led to remark, that the great majority of small boys and many small girls ought to have *morbus coxarius*, if the traumatic theory of this disease is exclusively true, because they are frequently falling on their hips, as well as on their backs.

If, now, we put our patient, having *morbus coxarius*, on a bed, elevate the foot of the bed for the purpose of counter-extension, raise the head and the shoulders somewhat on a pillow, apply an extending weight of six or eight pounds to the limb on the diseased side by means of proper apparatus, we will put the joint-tissues in a way to be pressed upon so that they will be approximately adjusted to their environment, because: (1) many of the muscles that span the hip-joint will have their origins and insertions brought nearer together; (2) because the antagonistic groups of muscles

will be more nearly in a state of equilibrium; and (3) because the extending weight, acting under the force of gravitation, and being always ready to act, will counteract the contracting muscles that span the hip-joint, and thus remove from the molecular structure of the hip-joint a very considerable part of the work that these muscles can do. These muscles are in an irritable and spiteful state, and having no discretion, will do too much work,—and so we let them work by lifting weights, instead of permitting them to drive the femoral head into the acetabulum. In fact, we tire out the muscles that span the hip-joint, and when they are in a condition to behave themselves in a better manner we take off the extending weight, put on somebody's splint, if it is well constructed, so as to repress and equalize the muscular contraction, and get our patient up and about, in order to prevent the deleterious effect on the general health of a too-long confinement in bed and in-doors.

FIRST LINES IN PATHOGENY.

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IF a portion of a viscus, or of any organ, is examined under a microscope, we observe a number of cells of a special kind held together by a matrix made up by cells of another kind, and separated into territories by canals of different kinds, with an interlacement of fine grayish fibres ; or the matrix may be composed of fine fibres derived from a cellular structure which has preceded them.

The study of these arrangements in the different organs and tissues constitutes histology, and is of very considerable importance to the physician.

But such a field bears about as much resemblance to what would be observed if the section could be viewed in the active working of life, as the contemplation of the moon would bear to the study of the earth covered with the active bustle of living beings. Such a contemplation is not a sufficient basis for the study of physiology. It cannot, therefore, suffice for the study of pathology ; for pathology is the physiology of the body when it has lost the order and regularity or harmony of health. Yesterday, the body was in a physiological condition ; it fell under some disturbing influences, and to-day it is in a pathological condition.

In what lies the difference between the histologic specimen and the living organ ? In the first place, in the section there is no ceaseless flow of fluid matter with its inpourings and its outpourings ; and in the second place, these pale gray fibres, separated from their reservoirs, are no longer

the conduits of ceaseless currents of energy or force. In the section the cells and fibres may remain unaltered for centuries, if properly preserved ; in the living organ, they are the subjects and the causes of incessant changes ; and these changes may themselves induce further changes, which shall be felt to the extremest boundaries of the individual of which that organ formed a part, and be also transmitted for centuries to that individual's descendants.

If the order of life depends on changes in matter of certain degrees and kinds, it follows, as a corollary, that the disorder of life depends on variances in the degrees or kinds, or both, of these changes. In other words, that all disease is structural, and that independent of change in structure there is no disease. Yet this idea is far too exclusive ; for the body, like all other terrestrial bodies, is affected by currents of force passing in close proximity to it ; its electric condition becomes changed from induction, and dynamic disturbances may be produced in it which consist entirely of waves of force transmitted in extraordinary directions, and the material changes which ensue are products and not causes.

For many years the cell-theory has held nearly exclusive sway in the doctrines of medicine. The cell is looked upon as the source of all life and activity ; all very well when we add to it a pabulum on which it may live, and a dynamism which may direct its activity. The physiology of the amœba, or of the hydra polype, can be no basis for human pathology ; nor, indeed, can the physiology of any being not human. Man is a law unto himself and to his race.

The old divisions of the medical schools, into Humoralists, Vitalists, and Solidists, have their antetypes in the cell-theories, the vascular theories, and the nervous theories of to-day. They all err alike in their exclusiveness, in denying the co-correctness of the other two.

In addition, therefore, to the cellular element of each and every part, we must add two other elementary components, —its vascular and its nervous elements.

These three constitute the elementary component parts of each and every organ and tissue, and besides these there is no other; as disease consists in disturbance of one or more of the component parts of the organ or tissue, all forms of disease will be comprised in

1, disorders of the cellular element;
2, disorders of the vascular element;
3, disorders of the nervous element,

of the affected organ or tissue, or in a combination of two or more of such disordered elements: and therapeutics will consist in the knowledge of the mode in which remedies act on these elementary parts.

Let us consider what transpires during the briefest period of the life of an organ; and we will suppose the organ to be in health. Its cells are healthy; its vessels of normal size and calibre, their vaso-motor nerves possessing the proper tension; its nerves are receiving and transmitting normal waves of force to and from the nerve-centres; the blood it receives is normally constituted, with its due amount of albumen, red corpuscles, salines, and water, and bearing a due supply of oxygen gas, of hydro-carbons, and of carbo-hydrates in solution; not overloaded with an excessive quantity of waste matter *en route* for excretion, or rendered impure by the presence of foreign matter. In short, the body and the part are in health.

When the blood flows into the capillaries, and from them into the intercellular spaces, several series of decompositions and of recompositions begin to occur. Part of the substance of the cells (cell-contents) is oxidized, and becomes split into two series of compounds,—one nitrogenous, the other non-nitrogenous; the former containing the fibrin

formed in the part during this first step of tissue-metamorphosis. Carbo-hydrates become oxidized, forming carbonic acid and water; and hydro-carbons also with similar results; salines also undergo change, and sulphur and phosphorus become oxidized.

The first result of the oxidation of hydrogen and the formation of water is, that the water in the part is increased in quantity, so that the veins cannot carry it back as well as the blood brought in by the arteries. We find, therefore, in addition to them, as an outpour from the part, the lymphatic vessels, which remove this excess of intercellular fluid, consisting mostly of water holding fibrin in solution.

During these oxidations of albuminoids, hydro-carbons, and carbo-hydrates, matter is being reduced from more complex to less complex states of chemical combination, and with such reduction in complexity is a necessary corresponding liberation of combining energy (chemical attraction). A part of this liberated energy forms the normal heat of the part; while another part of this liberated energy excites molecular movements (polar) in the nervine conductors, and is thereby conveyed from the part by the afferent nerves to the nerve-centres, to be thence reflected by the efferent nerves, in part to the organ itself, in part to other organs, in part diffused through the nerve-centres; while at the same time the efferent nerves convey to the part we are considering reflex waves from the other parts of the body. During this series of actions blood albuminoids are decomposed, nitrogenous matter being taken up by the cells to replace that which has been oxidized, other matters, nitrogenous and non-nitrogenous, being formed for the nutrition of other parts, so that it is all consumed when and as required. Under cell-activity, changes in matter, often of an isomeric character, are effected, and the

secretions of the various cells become formed. Thus again we find our three elementary parts,—the cellular, the vascular, and the nervous; and besides these, none.

The same result is reached by the study of the development of the individual, and of the gradual ascent in the scale of being. At first we have the formation of cells; then of a cell pabulum, the vascular element; and finally of the dynamic or directive element, the nervous element. However great may be the changes, and however varied may be the forms of these elements, no new element is formed in addition to these.

This view also brings into prominence what we know as "morbid processes"; those first deviations from the normal which constitute the starting-point of those entities which finally constitute our nosological tables. Moreover, the appreciation of these morbid processes renders diagnosis easy, and affords the only sure basis for rational therapeutics.

Disorders of the cellular element consist in deviation from the normal life-routine of the affected cells. Their life-work consists in nutrition, comprising the absorption, metamorphosis, and discharge of matter; in growth and reproduction; in changes of a special and particular kind induced in matter, alternating in secretion, or in the formation of blood; or in changes produced in waves of energy or force, alternating in the varied manifestations of nerve force, sensory, ideational, or motor.

The cells may absorb too much matter, and hypertrophy; too little, and atrophy; or matter of a wrong kind and be infiltrated; or they may not discharge effete matter, and degenerate; they may increase too much or not enough, or the mode of their increase may be abnormal. Thus they may form a neoplasm resembling the original tissue, as in tubercle; diverse from it, as in syphiloma; or abnormal in mode, as when by vacuolation they form a cancer. They

may react improperly on matter and form an abnormal secretion; or they may fail in such action altogether, when their secretion is suspended; while their dynamic activities may be disordered when local disorders in peripheral organs will give origin to neuroses of various forms: for if all parts of the body are represented in the nervous centres, dynamic peripheral disorder will induce central nervous disturbance.

Thus disorders of the cellular element form no small portion of human pathology; while the therapeutic question naturally follows: How can the cell-element be influenced in the desired way to produce the desired results?

Disorders of the vascular element are among the most prominent of all forms of disturbance, and have been considered, though erroneously, as the whole cause of departures from health. There may be too much blood in the body (plethora), too little blood (anæmia), or its composition may be changed: first, by changes in the proportions of its normal constituents, more or less, as water, albumen, fibrin, red and white corpuscles, fat, salines; secondly, by increase of the waste products it should normally contain, nitrogenous, carbonaceous, or hydrogenous compounds (toxæmia); or, thirdly, by the introduction of foreign matters which it ought not to contain (pus or sepsin); or, lastly, its distribution may be deranged, as in hyperæmia, active or passive; increased arterial tension, or diminished arterial tension.

Disorders of the nervous element present the most difficult problems in pathology. Where there is no nervous system, every cell possesses all the dynamic qualities which every other cell possesses. But after a nervous system has been developed, the other cells have their dynamic powers abridged, while those of this special (nervous) system have their dynamic powers enlarged; and their dynamic powers being enlarged, they are also made dominant. Thus, while

in the amœba a projection of some portion of the mass occurs in consequence of an impulse originating in that part, in man a leg or an arm is moved in consequence of an impulse originating in some central part of the nervous system (as a rule), and conveyed by efferent conductors to the part moved; and if these efferent conductors be severed, no active movement of the part can by any means possibly occur. Not only is the motor force (power) taken away during development from the cells of the leg and arm and given to some cells of the nervous centres, but the motor arrangements of the leg and arm are rendered subject to these same central nerve-cells, and move when they are told to move (receive a motor impulse), and do not move until the message (motor impulse) has been received.

Moreover, all this energy or force is derived from the liberation of the energy stored up in the food during its reduction from more complex to more simple forms of chemical combination.

Under a gradual decay of strength and substance, owing to a perverted metamorphosis of matter, the nutriment of the blood being consumed in the growth of a fungus hæmatodes, the sight began to fail, and at last entire blindness was the result, there being no pathological condition of either eye, except anæmia; and a similar result is occasionally observed in diabetes mellitus. Similar results have been observed in cases of simple starvation.

In the fish the egg is laid on the sand, there it becomes fertilized by the sperm from the male, and is left to itself. The young fish has a small store of nourishment in its yolk-sac to last it a short time. After that is expended, it derives all the matter that goes to make up its bulk at maturity, and all the force or energy which it exhibits, from the food which it consumes, and from that only. In the same way the human embryo, although formed by the fertilization of

the ovum by the sperm cell within the body of its female parent, is as much an independent, living, individuality as it becomes after birth, and gains its substance and its energy from its food, and from its food only. But as a certain body-temperature is necessary for the continuance of the union of its life with its matter, its development is performed within the body of its mother, whereby that temperature is preserved. While in the case of the chicken the necessary temperature is maintained by the application of the hen's body to the eggs.

The dependence of nervous energy on the introduction of matter into the body, as food, is seen more fully on the introduction of other substances, as alcohol, opium, cannabis, etc., as well as in the effects of insufficient food. The "gospel of fatness" has been long applied in the treatment of various forms of mental disease, as well as in the treatment of various forms of other somatic disease. Compare Clouston and Blandford on feeding in insanity, and Thomas on feeding in female complaints.

The axis-cylinders of the nerve-fibres and the neurine of the cells may be both considered as "cell-contents"; they are continuous with one another; and the office of each in the transmission of nervous energy is to vibrate, most probably in a polar manner; for if there is no molecular vibration (movement) there can be no transmission of nervous energy; during absolute rest no transmission can occur.

As forms of disorder in the nervous element we have first, increased vibratility; secondly, decreased vibratility; thirdly, increased, and fourthly, decreased, vibrations from abnormal degrees of peripheral impulse[1]; fifthly, abnormal routes of transmission may be taken, as in dreaming, in illusions or hallucinations; or sixthly, improper relations may occur, as when sensation, motion, and ideation are all

[1] The vibratility remaining normal.

diminished, but the general heat of the body is increased (pyrexia).

The sensation which we know as pain, is doubtless the result of increased vibration of the painful parts; while in loss of sensation, which is its opposite, the vibration in the local neurine has correspondingly ceased.

Nerve-force or energy may be subdivided into the three forms of sensation, ideation, and motion, either one of these being convertible into either of the others, their difference being neither of kind nor of degree, but solely of conduction and distribution. If when asleep the foot is tickled, the impression is followed by motion only; if while awake, it is followed by sensation and motion, or inhibition. During sleep the ideational cells are inactive. If the impression be sufficiently powerful to overcome the inactivity, awakening takes place with the return of their activity.

The nervous system is liable to disorders commencing in its cell-elements (neoplasms and sclerosis); to disorders commencing in its vascular element (anæmia, hydræmia, hyperæmia, toxæmia); and to disorders of a dynamic (functional) character, the results of impressions made upon it at its periphery (in the various organs, stomach, liver, heart, lungs, ovaries, uterus, etc., etc.); or the result of waves of force originating in disturbance of cell-contents (neurine) of intrinsic character (some forms of insanity); or the result of waves of force arising from chemical decompositions extrinsic to the cells but in their immediate vicinity (alcoholism).

As the whole body, every part of it, is represented in the nervous centres; and as any disturbance of any part involves the disturbance of its representative portion in the nervous centres, it follows as a natural inference, that local disturbance of these centres themselves (primary) must be followed by a corresponding local disturbance at the periphery in the parts these centres represent.

These dynamic (functional) nervous disorders are among the hidden mysteries of medicine at present, whether they are sensory, ideational, or motor in their character (the term motor being used to include all efferent impulses, as of secretion or nutrition). The relations of the cerebro-spinal and the sympathetic systems of nerves to one another, and to the rest of the body, are by no means understood, although we know their activities take opposite directions, they themselves being analogous to the negative and positive conducting wires of the galvanic battery.

We only appear to have established that when the water of the body generally, in the blood, the cell-contents, and the intercellular fluids, is in excess, there is a corresponding tenuity of the neurine, a great mobility, and a greater tendency to disorder; while a good rich blood and a firm nutrition tend to promote a density of the neurine, give it greater stability, and prevent it from being violently disturbed (flying off the handle) at the slightest impression.

As examples of complex morbid conditions, those in which several elementary parts are primarily and simultaneously involved to produce the existence of such conditions, are inflammation and pyrexia or fever.

In inflammation there are two necessary results: 1st, an increased production of fibrin in the inflamed parts; 2dly, a state of general excitation, known as the sympathetic inflammatory fever.

In pyrexia there are a diminution of all sensory, ideational, and motor activities (languor and lassitude), and a simultaneous expenditure of the energy liberated during the processes of life by oxidation, etc., as increased body-temperature (heat), with a gradual reduction of the formation of fibrin in the body.

In both, great changes from the normal occur in the metamorphoses of the alkalies,—soda, potash, and ammonia,

—and of matters combined with them, as chlorine, sulphur, and phosphorus.

It is evident that these conditions, phlegmasia and pyrexia, must be estimated in the commencement of these processes, before those secondary changes are produced which are the results, the products of these conditions after they have been established.

The factors which constitute inflammation and fever must be estimated on the first, not the forty-first, day of the disease, if it last so long; not even on the second day of its duration. The supply of food is stopped from anorexia; the resources on hand become soon exhausted; the depurative processes become checked; the typhoid state is common in both, as the result of the anæmia and toxæmia thus produced; interstitial decay is soon commenced, and the union of Life and Matter is soon terminated.

This union of Life and Matter, the living state, must not be confounded with the activities of a body while living. The germ cell and the sperm cell are both individually alive, but they neither present any activity of a living body. If either were dead the germ cell could not be impregnated; but both being living, and becoming blended together in one, this one—now termed the embryo—commences to manifest the activities of a living body, and continues to do so as long as it continues to live; its activities consisting in the appropriation of external matter, and the conversion of this matter into its own substance; and in the decomposition of its own substance and of external matter, with reduction of these to more simple states of chemical composition, the liberation of combined energy, and the conversion of this energy into the energy needed for its own dynamic purposes of sensation, ideation, and motion.

A consideration of morbid processes from this standpoint, not only leads to greater diagnostic precision, but it also

tends to greater therapeutical precision, for the question naturally arises: If this or the other element of tissue is at fault, what agent will act on that element, and control its disorder, and lead it back to normal action ?—and this leads back to a division of therapeutic means according to the element on which they act. A remedy which will control cell-activity, whether nutrient, secretory, or formative, will not necessarily act on the vascular or on the nervous element. A remedy which will act on the vascular element, whether augmenting or diminishing its volume, altering its composition, increasing its production, or hastening its depuration, modifying its distribution or the rate of its transmission, will not necessarily act on the action of structural cells, or on the manifestation of dynamic potencies. And in the same way, remedies which modify the correlations and distributions of energy will not necessarily influence the actions of cells, or the composition or the distribution of the blood.

Take, for instance, the actions of such remedies as iodine and mercury. In the case of neoplasms, syphilitic and scrofulous (*vide* Graves, "Clin. Lect."), the long-continued use of mercury in small doses will cause their disappearance. It seems to exert a specific influence on cell-action, and as a result its protracted use may cause cancrum oris, or caries of bones. In the same way I have myself seen, under the protracted use of iodine, the female mammæ disappear; and under the protracted use of iodide of potassium, one testicle disappear entirely and the other be diminished to the size of a large pea, about half an inch in diameter.

The remedies which act on the vascular element are numerous: alkalies and acids; digestives, as pepsin and pancreatin; depuratives, as purgatives and diuretics; diluents and nutrients,—all act on the vascular element and modify its composition.

The remedies which act on the nervous element primarily are about the most numerous in our materia medica. Some act directly on the nerve-tissue, as opium, Indian hemp, hyoscyamin, digitalis, etc., etc.; others act on the vaso-motor nerves, as amyl nitrite and the other nitrites, ergot, bromides, heat, cold, etc., etc. Mechanical means control the supply of blood, as compression; or removing atmospheric pressure, as Gunod's boot or the like.

When we inquire, On what element does any remedy act primarily? we shall find that we can refer its action to one of these three primary tissue-elements,—the cell, the fluid, and the nerve,—and if we can not so refer its action, its use is always doubtful; for the relation between the disease and the means of its cure must always be most intimate, and must be capable of being predicated to make the treatment of such disease rational.

GUDDEN'S ATROPHY METHOD: AND A SUMMARY OF ITS RESULTS.

By E. C. SEGUIN, M.D.

MUCH as we honor the discoverer of a new fact of importance or of a series of facts, we owe much more to him who places at our disposal a new method, one sufficiently tried to merit adoption at our hands. A method is a chapter of applied logic, pregnant with possible results of unknown importance. And this is not its only value, for, as a part of the logic of science, it also serves a purpose in scientific speculation, and almost inevitably gives rise to new ideas, to other methods, by analogy or by deduction.

Gudden's atrophy method, one of the anatomical methods applied to the study of that obscure field of research—the central nervous system,—lay hidden, most unfortunately, in the possession of its originator and a few pupils, for nearly thirty years, and even since its publication in 1872, it has been but little noticed outside of a very small circle of neurologists.[1] Yet, I think that the following abstract will show it to be one of the most important and promising of the various special anatomical methods.[2]

From 1850 to 1852 Augustus Waller was at work in Budge's laboratory at Bonn, perfecting his method of studying the degeneration of severed nerves. The facts of degeneration and regeneration after nerve-section had been long known, but it remained for Waller to formulate the

[1] In the most recent scientific work on anatomy (Burt G. Wilder and Gage, "Anatomical Technology," New York, 1882), containing a remarkably full bibliographical index, the name of Gudden does not appear.

[2] The special anatomical methods applied to the study of the central nervous

law under which the degenerative process occurs. In his "*Nouvelle méthode anatomique*," Bonn, 1852, he gave a full summary of the facts and laws he had discovered, and they have been common property ever since, leading to numerous important anatomical and pathological discoveries. The doctrine of the Wallerian degeneration, has, I may say, been a valuable instrument in our hands for thirty years.

At the very same time, 1849, Gudden, a recent graduate of the University of Berlin, then assistant physician in the Siegburg insane asylum under the celebrated Jacobi, was experimenting upon the brains of animals in a different, yet correlative, manner. He had already extirpated eyes of rabbits, and noted the atrophy of the intracranial optic apparatus; he already knew the tractus peduncularis transversus, and many of his subsequent discoveries were half developed.[1] This was done in ignorance of Waller's work, and partly before it; certainly long before Türck's publications on secondary degenerations.

For reasons best known to himself, Professor von Gudden did not publish an account of his method until 1870,[2] although his principal facts and laws had long been known to him, and he had communicated freely with friends and assistants, so that we have here a striking example of the simultaneous discovery of facts, laws, and methods which, applied to the same division of the animal frame, are in themselves not very unlike, and in their results are logically united, and, indeed, complementary to each other.

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system are: (a), The dissociation or dissection of fasciculi in partially hardened specimens, as practised by older anatomists, by Foville, Gratiolet, Broadbent, and many others (nearly disused); (b), the Rolando-Stilling method of series of fine sections of the hardened organs; (c), the Wallerian degeneration in animals; (d), the Türck secondary degenerations in man (and in animals); (e), Flechsig's method of determining the period at which certain systems of fibres in the fœtus acquire myelin.

[1] Oral communication from Prof. v. Gudden, August 4, 1883.

[2] Experimentaluntersuchungen über das peripherische und centrale Nervensystem. *Wesphal's Archiv*, Bd. ii, p. 693.

I purpose in the following pages to enunciate the central principle of Gudden's method, and then to analyze his publications and those of his pupils, more or less in chronological order with reference to publication. Besides consulting these publications, I have had the advantages of conversing with Prof. Gudden and several of his pupils, and of examining the specimens proving the statements advanced in nearly every case.

PRINCIPLE: *That by experimenting on newly-born animals, especially those which, like the rabbit, are brought forth in a somewhat fœtal state, complete atrophy of the central connections of a nerve-trunk, or a nerve-fasciculus, or a nerve-centre, is obtained by operation. The central (proximal) fibres and cells are destroyed, while the peripheral fibres, if any, undergo the Wallerian degeneration.*

There are several secondary advantages in using very young animals; they (rabbits at least) have almost no hair; they suffer but little pain, and scarcely struggle under the knife; they bear the shock of incision and removal of important parts of the central nervous system wonderfully well; hæmostasis is in them very rapid and definite, and the process of repair simple.

For operations on nerve-trunks, almost any animal can be used. For experiments on intracranial parts, dogs are objectionable because of their hard craniums; kittens are intermediate between rabbits and dogs in this respect, but they are liable to suppuration, and the mother is apt to interfere with the sutures.

Most operations should be done on the second or third day of life, but may succeed later; still, the older the animal the more the Wallerian law of degeneration in one direction (centrifugal from centre) only prevails.

For most operations on the olfactory apparatus it is

necessary to wait until the animal (rabbit) be six or seven days old, in order to give time for the ears (hearing and tactile sense) to develop sufficiently to enable the creature to guide itself and find the mother.

For operations on the hypoglossal and vagus nerves one must wait still longer, from the second to the sixth week.[1]

The various operative procedures will be described under the several heads of this review, but it is well to state here that the lesion should be a *destructive* one; the olfactory lobe or eyeball must be removed, or in the case of nerves, their central ends after section must be pulled out of their bony canals with good forceps. In the case of nerves in newly-born animals, so much comes away by this method that there is reason to believe that some axis-cylinders are broken off deep in the nervous centre from which they spring.

It is possible that some of Gudden's operations give results as much by degeneration as by simple atrophy; in other words, that his and Waller's method overlap each other. In this connection let me say that the histology of the early period of Gudden's atrophy is unknown, which is a deplorable hiatus in our knowledge. From a study of this point we may learn something of the obscure point referred to, viz., the true relation between the two methods, and obtain new light on so-called "trophic" laws of the nervous system.

The operated animals are left to the mother's care, and allowed to grow from six to twelve weeks; the former period being quite sufficient for most experiments. Indeed, Gudden has shown[2] that after removal of one eyeball in dogs one day old, distinct atrophy of the optic nerve was

[1] Oral communication from Prof. v. Gudden.

[2] *Archiv f. Ophthalmologie*, Bd. xxv, Heft 4, pp. 237–246, 1879.

visible on the 8th, 14th, and 28th days. In rabbits a distinct atrophy may be visible in 36 hours after operation on second day.[1]

During this period of preservation, the animals should be carefully studied as to their functions, with especial reference to the injured apparatus, and compensatory functions. By doing this in as careful a manner as Munk has done for his cortex experiments, some physiological and psychological knowledge might be gained from each series of operations. This has been done, but not as fully or exactly as should be.

After the animals are sacrificed, the affected parts should be carefully examined for asymmetry, change in color and consistence. If possible, photographs of the fresh specimens should be taken, and careful measurements of parts made. The organs are then placed in a solution of bichromate of potassium, or of osmic acid, for hardening. When this is complete the various sections necessary to reveal the direction and extent of central changes are made and preserved in accordance with well-known methods. It is often desirable to have complete series of sections through the whole organ or a portion of it, so as to enable the exact extent and distribution of the atrophy to be followed. In such cases the use of Gudden's microtome is necessary. The sections should be thin enough to allow of their examination by $\frac{1}{5}$ or $\frac{1}{8}$ inch objectives. Usually trans-sections show the lesion well, but in some cases (olfactory part of anterior commissure) longitudinal dextro-sinistral sections are necessary.

The condition of the atrophied centres may be roughly stated as follows: As an example, after extraction of the facial nerve, a series of trans-sections of the medulla show simply an absence, a total absence, of the injured nerve.

[1] *Ibidem*, Bd. xxv, Heft 1, pp. 1–56.

trunk in its course through the medulla, and of its nucleus of origin. There is, architecturally speaking, a virtual void in this region, which is filled up or compensated to a degree by the ingrowth and overcrowding of adjacent normal parts. There are no exudations, thickening of neuroglia, areas of disintegration, etc., so that the topographical study of the sections and the tracing out of the atrophy are not hindered as in ordinary pathological specimens.

RESULTS OBTAINED BY GUDDEN'S METHOD.

I propose mentioning these very briefly and without criticism. Many of the questions to which the experiments relate are novel and intricate; further researches by other methods may modify the views held by Gudden and his pupils, but these views should be plainly stated so as to serve as data for other observers. Enough will be found in this abstract to justify, I think, the statement that we already owe much in anatomy and physiology to this method, and that it offers great possibilities for the future.

The topics will be considered partially in chronological order.

I.—Composition and connections of the commissura anterior cerebri.

Von Gudden and Ganser have been able to resolve these two questions in greater part by the atrophy method. It has long been known that the C. A. consists of two unequal fasciculi, variable in different animals, and these Ganser calls (1) pars temporalis; (2) pars olfactoria. In general terms, as revealed in normal sections, the p. t. is very much larger in man and in monkeys, while in lower mammals, particularly the hedgehog, mole, and rabbit, the p. o. is highly developed and larger than the p. t.

1. Pars temporalis. Von Gudden, in 1870,[1] published experiments illustrating the nature of the pars temporalis.

EXPT.—In a newly-born rabbit the whole upper part of one cerebral hemisphere was excised, above the basal ganglia. Autopsy at eight weeks showed the commissura anterior normal.

EXPT.—In another rabbit the whole of one hemisphere was removed. Seven weeks later the animal was killed, and sections of the (hardened) brain showed complete atrophy of the commissura anterior. The external capsule was, however, preserved in the remaining hemisphere.

In both experiments there was atrophy of the corpus callosum, complete in the latter.

Conclusions: the temporal division of the C. A. is a true commissure, as is also the corpus callosum.

The external capsule has no direct connection with the C. A.

These experimental results have been confirmed by Ganser. The conclusions are, moreover, supported and extended by the result of the careful study of complete series of brain sections of man, monkey, and lower mammals, made by Ganser.[2] The sections were transverse and horizontal, and in them the course of the C. A. (its pars temporalis) was always distinctly into the temporal lobe, beyond the nucleus amygdalus. No fasciculi going to other parts of brain (occipital lobes, Meynert et al.) could be discovered.

2. Pars olfactoria. Von Gudden experimented on this also, but his conclusions were invalidated by a source of error discovered later on. It is to Ganser (op. cit.) that we owe the absolute demonstration of its true nature and distribution by means of von Gudden's method.

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[1] Experimentaluntersuchungen über das peripherische und centrale Nervensystem. *Westphal's Archiv*, Bd. ii, p. 693, experiments v and vi.

[2] S. Ganser: Ueber die vordere Commissur der Säugethiere. *Westphal's Archiv*, Bd. ix, Heft 2, 1878.

EXPT.—The brain of two rabbits formerly operated by von Gudden were cut into complete series of horizontal and transverse sections. The injury consisted in destruction of the left tractus olfactorious and frontal part of lobus pyriformis with a portion of adjacent (dorsal) frontal lobe. The left bulbus olfactorius (lobus olf.) was very much atrophied. In both sets of sections (the horizontal best adapted) there was complete absence of the olfactory division of the C. A.

EXPT.—Two other rabbits from whom von Gudden had removed one of the bulbi olfactorii. These brains were shrunken and overhardened, yet fairly good sections were obtained, enough to show that in these two cases also there was complete atrophy of the p. ol. of the C. A.

Conclusions: the pars olfactoria of the C. A. is also a true commissure, and unites the two bulbi olfactorii.

Thus, by a few simple experiments and careful observations (objectively carried out) of preparations, is that fanciful fabric, Meynert's olfactory chiasma overturned.

II.—Commissura inferior cerebri.

Almost from his earliest experiments on the optic apparatus, von Gudden had observed that after removal of both eyeballs, a portion of the chiasma and of the optic tracts did not undergo atrophy. In his first published accounts[1] of the structure of the optic nerves, etc., he formulated this observation by naming the surviving or non-atrophied nervous band, commissura inferior cerebri, and expressed the opinion that it was a commissure between the thalami. In the first of his series of contributions[2] in *Græfe's Archiv*, these preliminary demonstrations are repeated. In the third contribution,[3] in reply to certain statements of Michel,

[1] Experimentaluntersuchungen über das peripherische und centrale Nervensystem. *Westphal's Archiv*, Bd. ii, p. 693 (1870).
Sitzung der viii Versammlung der Schweitzarischen Irrenærzte (Sept., 1872), abstract in *Psychiatrische Zeitschrift*, Bd, xxx, p. 135.

[2] Ueber die Kreuzung der Fasern im Chiasma Nervorum Opticorum. *Archiv f. Ophthalmologie*, Bd. xx, Heft 2, pp. 249–268, 1874.
The second contribution is in Bd. xxi, Heft 3, pp. 199–205, 1875.

[3] *Idem*, Bd. xxv, Heft 1, pp. 1–56, 1879.

he insists upon the distinction between this fasciculus and the one known as Meynert's commissure, which is distinctly dorsal of the chiasma, and separated from it. The commissura inferior, on the contrary, is mingled with the tractus opticus and can only be discerned by excluding the fibres of the latter, which is easily done by removal of both eyeballs in the young animals, thus producing atrophy of all the truly optic fasciculi.

Sometimes in the rabbit, dog, and cat, a slight depression in the caudal-ventral aspect of the chiasm suggests its limits.

In trans-sections of rabbits' tractus opticus no special limit is discernible; but it is noticed that while the optic fibres are coarse, those of the C. I. are fine. If one of these trans-sections be treated with alcohol and then with carmine the portion belonging to the C. I. is strongly tinged, while the optic fibres remain white. The same reaction has been obtained by Mayser in the T. O. of cyprinoid fishes. In dogs, cats, monkeys, and man no such chemical distinction exists. If the sections of rabbits' T. O. are placed unstained (only colored by potassium bichromate) in glycerine, the fibres of the C. I. appear as forming a clearer mass in the dark field of the optic fibres.

In his fourth optic contribution,[1] von Gudden describes the appearance of the optic apparatus in a human case of long-standing one-sided blindness. Those parts in the chiasma and tractus optici which correspond to the C. I. he found unchanged, but not distinctly limited, and made up of fibres having the same diameter as the optic fibres. The C. I. in these trans-sections was dorsal of the optic fibres. In the chiasma of animals it occupies the caudal, or the caudal-ventral, aspect.

In his "Experimentaluntersuchungen," he states, that

[1] *Archiv f. Ophthal.*, Bd. xxv, Heft 4, pp. 237–246, 1879.

the study of numerous trans-sections of the brain has shown that the commissura inferior extends into the thalami optici, connects them, and is probably in no wise associated with the optic apparatus. After destruction of the lobus opticus and the corpus geniculatum laterale, the commissura inferior remains unchanged.

In connection with these important studies upon the commissural systems of the brain (corpus callosum, commissura anterior, and commissura inferior) von Gudden has formulated the following law of atrophy (of nutrition):

That a true commissure, separated from one of its attachments, must undergo bilateral atrophy.

III.—Distribution of fibres in the optic apparatus.

As stated in the four articles in *Græfe's Archiv*, von Gudden has reached the following conclusions:

1. That in birds there is complete decussation of fibres in the optic chiasma.

Expt.—Removal of one eyeball in a pigeon immediately after birth. Autopsy in eight weeks showed atrophy of optic nerve of same side, extending across the woven chiasm to the opposite optic lobe, which is much reduced in size.

2. In the higher mammalia the decussation is variable, but is always a semi-decussation.

Expt.—In a rabbit,[1] the right eyeball was enucleated. Results: (*a*) atrophy of right optic nerve; (*b*) chiasma unchanged; (*c*) opposite (left) tractus opticus swollen, as are also (*d*) the lobus opticus, and (*e*) the corpus geniculatum laterale; (*f*) complete atrophy of opposite left tractus peduncularis. Negative results: post-optic lobes (corpus quadrigeminum inf.) and commissura inferior normal.

This experiment seemed to show that there was complete

[1] It was always in newly-born animals that the various operations were done.

decussation in the rabbit, and so Gudden held for some years, but different experiments, published in 1879,[1] demonstrated beyond question the existence of a direct fasciculus in the optic nerve of this animal.

Expt.—By means of a sharp spoon, the optic lobe, corpus geniculatum externum, subjacent part of caudex, and corresponding optic tract are removed. Autopsy at age of six months. Results : (*a*) total atrophy of injured tractus opticus ; (*b*) opposite optic nerve atrophies in greater part, but still showing a small normal white fasciculus.

Expt.—The brain was lifted up, and one half of chiasm cut out with a sharp spoon. Results : complete atrophy of the optic fibres, except a small (lateral) bundle in opposite optic nerve—its direct fasciculus—(in this experiment the commissura inferior undergoes atrophy, as does also Meynert's commissure dorsal of tractus).

As complementary to these results may be added the fact that one of Gudden's assistants, Dr. Bumm,[2] carefully examined the retina of the eye receiving only the direct fasciculus, and found the nerve-fibre layer atrophied, except in the lateral (temporal) segment of the organ. The retina was hardened in osmic acid, and the whole of it cut and prepared.

Consequently, it must be held as demonstrated that in rabbits there is semi-decussation, but to a slight degree only, as the crossed fasciculus is enormously larger than the direct ; and that this small direct fasciculus supplies the temporal part of the retina in dogs.

Expt.—Right eyeball enucleated. Results : (*a*) complete atrophy of right optic nerve ; (*b*) both optic tracts reduced in size, the left smaller ; (*c*) both optic lobes smaller ; (*d*) both corpora geniculata laterala smaller ; (*e*) caudal cords of thalami smaller ; (*f*) tractus peduncularis smaller. The commissura inferior was preserved.

Expt.—" Optic centres " (lobus opticus and corpus genicu-

[1] *Arch. f. Ophthal.*, Bd. xxv, 1, pp. 1–56, 1879.

[2] Bumm : Ueber die Vertheilung des Sehnerven in der Netzhaut des Kaninchens. *Westphal's Archiv*, Bd. xi, p. 264, 1881.

latum laterale) removed on right side. Results : (*a*) tractus opticus of same side atrophied ; (*b*) both optic nerves reduced in size, opposite (left) smaller ; (*c*) commissura inferior preserved.

In dogs, consequently, there is also semi-decussation, to a greater extent than in rabbits, but still the direct fasciculus is smaller than the crossed.

The course of the direct fasciculus in the dog (as seen in horizontal sections of chiasm from above experiment), lies in the dorsal border of right tractus opticus; reaching the chiasm it passes over the crossed fasciculus from the other tractus, and then from the medial border of the optic nerve on same side (right). In rabbits this fasciculus lies in the lateral border of optic nerve.

Numerous experiments of these kinds are recorded in the various papers, and elaborate measurements given of the areas of the affected optic nerves and tracts.

Gudden formulates the law of atrophy in the optic apparatus as follows :

1. The optic nerves and tracts degenerate (undergo atrophy) when the retina is destroyed (removed).

2. The "optic centres" (lobus opticus and corpus geniculatum laterale) also undergo atrophy in such a case.

3. When the centres are removed, the degeneration does not involve the retina.

In man, reasoning by analogy from the higher mammals experimented on it, would seem that semi-decussation were a logical necessity, yet several advocates of complete decussation have appeared.[1] These arguments have, however, been very weak, and Gudden made short work of their few experimental claims.[2] Cases of long-standing monocular blindness in man, fitted for the direct solution of the problem, are not infrequent, but few of them have been properly

[1] Chiefly Michel, *Arch. f. Ophthal.*, Bd. xxiii, Heft 2, pp. 213-226, 1877.

[2] *Arch. f. Ophthal.*, Bd. xxv, Heft 1, pp. 1-56, 1879.

studied. Von Gudden has had the opportunity of examining four such cases.

CASE 1.—Man eighty-five years old; blind in one eye from early youth: phthisis bulbi. The atrophy is not total, many normal nerve-fibres being found in affected optic nerve. Both tractus smaller than normal.

CASE 2.—Man thirty years old; complete atrophy of left optic nerve (not one fibre found in a careful microscopic examination); both tractus reduced in size, one on opposite side smaller.

CASE 3.—Male, dying at sixty, with left hemiplegia. Thirteen years previously had had an attack of "apoplexy." Besides the lesion in one internal capsule explaining the hemiparesis, there was found an old hemorrhage which had destroyed the left corpus geniculatum laterale, part of the thalamus opticus, and part of the tractus opticus. The whole tractus was atrophied; the opposite optic nerve smaller, and the nerve on same side contained many atrophied fibres, and was smaller (on section) in its medial and central fasciculi. (The case is obscurely reported, and there seems to be an error in the designation of the optic nerves.)

CASE 4.[1]—Woman, aged seventy-three years. Glaucoma and complete loss of sight in right eye for four years. The right optic nerve was completely atrophied; the right tractus opticus seemed normal to naked eye; the left tractus was smaller and mostly gray; on the chiasma itself, and upon the left tractus, crossing chiasm from the frontal medial border of left optic nerve, was a projecting white band, the direct fasciculus from left eye. The microscope showed the left tractus all gray except in its dorsal aspect, where some normal nerve-fibres were seen; the right tractus, on the other hand, presented (in sections) only a small area of atrophied fibres (the direct fasciculus from the right eye, and the commissura inferior). The degeneration and atrophy extend to the optic centres, *i. e.*, the left corpus geniculatum laterale and lobus opticus.

These cases certainly favor the theory of semi-decussation.

The following is a general summary of von Gudden's results with respect to the optic apparatus.

1. That Johannes Müller's law (which was only a physiological postulate), that in animals whose visual axes are

[1] *Arch. f. Ophthal.*, Bd. xxv, Heft 4, pp. 237–246, 1879.

only lateral (monocular vision) there is total decussation, and that in animals whose visual axes are more or less directed forward (more or less perfect binocular vision) there is semi-decussation, is a good law, supported by his (Gudden's) experiments and other facts.

2. That there is no anterior commissural (inter-retinal) fasciculus in the optic apparatus.

3. That the posterior commissural fasciculus of classic authors is his commissura inferior, which has no relation to the optic system.

4. That the optic system in mammals consists only of two bundles or fasciculi, one crossed and the other direct; the former the larger in rabbits, dogs, and cats (and quite certainly in man).

5. That there is an accessory optic fasciculus, whose central and peripheral terminations are yet unknown, viz., the tractus peduncularis transversus.

6. That each optic tract is composed of three sorts of fibres, of the same size in man, of different sizes and different carmine reaction in animals; optic fibres (crossed and direct), fibres of the commissura inferior, and "hemispheric fibres," whose course is not well known. These last-named fibres are in the most lateral part of the tractus and pass into the crus cerebri.

These results were confirmed by the experiments of von Gudden's pupil—Ganser—on cats, published last year.[1] This able observer has also carried the inquiry further, as regards the cortical and retinal distribution of optic fibres, affording a remarkable concurrence between von Gudden's results and Munk's.

Ganser chose cats, for several reasons. They are vigorous under operative interference; they are more intelligent

[1] Ueber die periphere und centrale Anordnung der Sehnervenfasern und über das Corpus bigeminum anterius, *Westphal's Archiv*, Bd. xiii, Heft 2, 1882.

than rabbits, so that one can test their visual field; they have, to a remarkable degree, binocular vision, and thus resemble man; their retina has a very high and clearly defined structure, thus affording excellent opportunity for ophthalmoscopic and microscopic study.

He relates three crucial experiments as follows:

Expt. 1.—For the determination of the direct fasciculus. On the third day after birth, the left eyeball of a kitten was enucleated. A fine forceps was introduced through the foramen opticorum, and the tractus opticus of the same side torn or cut (at the same time unintentionally a slight wound was made in the infundibulum and left internal capsule). Cat recovered quickly and grew normally; was, however, lazy or stupid, more so than a brother kitten who had lost one hemisphere. Vision seemed good till tested, when it was found it had hemianopsia, *i. e.*, was using only the temporal half of its remaining retina. Autopsy at nine months. The only part of optic apparatus left was a white nerve extending from right eyeball to the optic centres of same side; no chiasm. Right optic lobe and corpus geniculatum laterale larger. The right tractus peduncularis transversus was smaller than normal, the left almost invisible; commissura inferior absent. Sections of the hardened retina showed normal nerve-fibres (amyelinic in cat), only in its temporal two thirds; on nasal side fibres and ganglionic bodies atrophied.

Conclusion: there is a true fasciculus lateralis (or direct fasciculus) in the optic system of the cat, and it supplies the temporal part of the retina.

Expt. 2.—To determine the relation between the occipital cortex and the optic apparatus.

In a kitten of same litter a portion of the left occipital lobe was removed without wounding the cornu ammonis or the basal ganglia. The injury was smaller but similar in location to that done to a dog's brain by von Gudden.[1] This cat had no symptoms, but special tests (by means of a white ball swung around the cat in direct and inverse directions) revealed right homonymous hemianopsia. Ophthalmoscopic examination showed

[1] *Archiv f. Ophthal.*, Bd. xxi, Heft 3, pp. 199–205, 1875.

morbid changes in the temporal two fifths of the left retina, and in the right eye more than the medial (nasal) half was atrophied. Autopsy at nine months. Left hemisphere shows scar opening freely into lateral ventricle (no inflammatory action). Left tractus opticus smaller than right, revealing more of Meynert's commissure on the crus. The optic nerves seemed little, if at all, changed to the naked eye, but on measuring the area of sections under the microscope, the right nerve-sections were found smaller.

Microscopic examination of the hardened retinæ showed no local elemental atrophy, but there was distinct thinning of the retina in both left halves (left temporal and right nasal halves), especially distinct in the papillæ.

Expt. 3.—For the same purpose. In a third kitten the left hemisphere of the cerebrum was nearly all removed, the corpus callosum and fornix being carefully cut in the medial line. The animal grew well and was not at all paralyzed. The only movement which he learned late was springing up on a chair, etc. Was dull and had a bad memory. Tactile sensibility and reflex movements seemed normal, but pricking was but little felt over whole body. As in the former cat, there was right homonymous hemianopsia. Ophthalmoscope showed the temporal part of retina atrophied in left eye, while in the right the morbid changes extended over two thirds of the retina (more than nasal half). Autopsy at six months. Large serous sac in left brain ; olfactory bulb and lobe, base of temporal lobe, and basal ganglia uninjured ; left thalamus smaller ; internal capsule atrophied ; left half of pons, and left crus cerebri smaller ; left anterior pyramid absent ; left optic centres (optic lobe and corpus genic. laterale) are smaller. Both tractus optici smaller than those of normal kittens of same age ; left more reduced. Under microscope the section-areas of both optic nerves diminished, right more. Sections of hardened retinæ showed, as in former case, a thinning of retinal layers in both left halves—left temporal and right nasal segments.

Conclusions: In cats the crossed fasciculus is larger than the direct. In cats there is an anatomical connection between the hemispheres (visual area in occipital lobe) and the optic centres, extending thence to the retinæ.

Gudden's old experiment,[1] showing that in rabbits re-

[1] Experimentaluntersuchungen, etc. *Westphal's Archiv*, Bd. ii, p. 693, 1870.

moval of one hemisphere has no influence on optic nerves, was repeated with the same results in six young rabbits.

It would thus appear that in lower mammals (those with insignificant binocular vision) the optic-nerve fibres are chiefly collected in the optic centres (optic lobe and corpus geniculatum laterale), while in higher mammals, dogs, cats, monkeys, as in man, there is a large, better differentiated cortical connection.

The new and most interesting question of the anatomical relation existing between the layers of the optic lobes and the peripheral optic apparatus on the one hand, and the visual area of the cortex cerebri on the other hand, was studied in the rat as follows:

Expt. A.—White rat three days old. Right eye enucleated. Autopsy at nine months. Right optic nerve atrophied; left tractus much smaller than right; left optic lobe and corpus geniculatum laterale flatter and smaller.

Expt. B.—White rat three days old; removal of convex part of right cerebral hemisphere (part of cornu ammonis also removed). Autopsy in nine months. Both optic nerves alike; right thalamus, optic lobe, and corpus geniculatum a little smaller. Right internal capsule atrophied, crus cerebri smaller, anterior pyramid absent.

The brains were subdivided into segments and hardened in a two-per-cent solution of osmic acid (24 hours), and later in alcohol. The optic lobes were cut into fine trans-sections, which were carefully examined.[1]

In rat A there was a reduction of the left superficial gray, and nearly total atrophy of the superficial white (*fibre visiva* of Tartuferi[2]); intermediate white normal on both sides. [Effects—one-sided in rat because of insignificance of direct fasciculus.]

In rat B, on the right side, the intermediate white was reduced, and there was also partial atrophy of the right side of the tubular gray (from what cause?).

[1] In the normal optic lobe Ganser distinguishes the following layers: 1. zonal fibres (present only in higher mammals); 2. superficial gray; 3. superficial white; 4. intermediate gray; 5. intermediate white; 6. deep-seated white; and 7. the tubular gray.—Ganser: Vergleichend-anatomische Studien über das Gehirn der Maulwurfs. *Morphol. Jahrbuch*, Bd. vii, p. 711.

[2] *Fibre di origine del tratto ottico* in the *strato bianco-cinereo superficiale* of

Conclusions: In rats the peripheral optic apparatus is more intimately connected with the superficial gray and white layers of the optic lobes, while the visual area of the cerebrum is mostly in relation with the intermediate white layer.

It may not be wholly superfluous to add that an important negative conclusion from the work of von Gudden and his pupils is, that neither the post-optic lobes (corpora quadrigemina inferior) nor the corpora geniculata medialis are connected with the optic apparatus; a view which is borne out by morphological conditions, etc.

IV.—Tractus peduncularis transversus.

When von Gudden published his first account [1] of this interesting fasciculus he was unaware that it had long been known; but he himself rectified his error by giving a bibliographical account of it along with his later experiments.[2] The bundle was unknown to most of the older anatomists, but Gall and Spurzheim[3] described and figured it in several plates as early as 1810. Von Gudden knew it (in connection with his first optic experiments) as early as 1849. In Leuret and Gratiolet's atlas[4] it is drawn by the artist but not referred to by the author (Gratiolet). An Italian investigator appears to have described it in 1861, under the name of *fascio transverso.*[5]

Tartuferi. (Sull' anatomia minuta dell' eminenze bigemine anteriori delle scimmie. *Rivista Sperimentale di Freniatria*, v, F. iii, 1879.

[1] Ueber einen bisher nichbeschreibenen Nervenfaserung im Gehirn der Säugethiere und das Menschen. *Westphal's Archiv*, Bd. ii, p. 364,—1870.

[2] Ueber den tractus peduncularis transversus. *Westphal's Archiv*, Bd, xi, Heft 2, 1880.

[3] "Atlas d'anatomie et de physiologie du système nerveux en général et du cerveau en particulier." Paris, 1810.

[4] "Anatomie comparée du système nerveux." Paris, 1857.

[5] A proposal has recently been made by a distinguished American zoölogist, Wilder, "Anatomical Technology," New York (1882), to change this name to *cimbia.* This term has no anatomical sense whatever its architectural value may be. Von Gudden's name, on the contrary, if long, is descriptive and

As its name correctly implies the tractus ped. trans. traverses the crus cerebri (peduncularis). It apparently arises from just within the medial border of the crus, passes over it in a line about half-way between the caudal edge of the tractus opticus (and Meynert's commissure) and the frontal border of the pons, extending lateral and dorsal to the frontal edge of the lobus opticus where it disappears. The tractus ped. tr. is thus distinctly traceable only in the lower mammalia; in man it is but slightly visible in a part of its course.[1]

Von Gudden has endeavored, but thus far in vain, to determine the true origin and destination of this fasciculus. As regards its function he long ago learned something from his various extirpation experiments on the optic apparatus. The facts have already been incidentally stated, but a more direct quotation is permissible.

EXPT.—Extirpation of both eyes in rabbit. Results: atrophy of optic nerves, of optic part of chiasm and tractus optici, of primary optic centres, *and of both tractus pedunc. tr.*

EXPT.—Extirpation of one eyeball in rabbit. Results: atrophy of optic nerve, of opposite optic tract (very slight of tract of same side), of primary optic centres of opposite side, *and of tractus pedunc. tr. of opposite side.*

EXPT.—In the dog after enucleation of one eyeball there are: atrophy of optic nerve, of both optic tracts, and both sets of primary optic centres, *and of both tractus pedunc. tr.* In all the parts caudad of chiasm the atrophy is more marked on the side opposite the enucleation.

EXPT.—Excision of part of occipital lobe in a dog, and removal of one optic lobe in a rabbit, were followed, among other results, by reduction in size of the corresponding tractus pedunc. tr.

Conclusions: The tractus peduncularis transversus has a

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equivalent to a definition—consequently it is good and should be retained. From the context in Wilder, *op. cit.*, § 1203, p. 475, it seems that he does not know Gudden's now old discovery of the optic nature of this fasciculus.

[1] *Cf.* Schwalbe: "Lehrbuch der Neurologie," p. 459. Erlangen, 1881.

functional and anatomical connection with the optic apparatus—more with its peripheral part, to which it stands in the same relation as the crossed fasciculus of the tractus opticus. Its connection with the primary optic centres is direct, but less intimate; its connection with the visual area of the cerebral cortex is still less marked, but also direct.

OSTEITIS DEFORMANS.

By S. J. WIGHTMAN, M.D.,

PITTSBURGH, PA.

Samuel Lappey, æt. twenty years, laborer, was born in Pennsylvania. Came under my care on the 26th of August, 1878, suffering from what I supposed at the time to be chronic articular rheumatism. A few years previous to this time he had fallen from a building thirty feet high, lighting upon a pile of bricks, injuring, as was supposed at the time, only his feet. A few weeks afterward his limbs became painful, his feet twisting upon the ankles and causing an excruciating pain, as of rheumatism, for which disease he was treated. Pressure aggravated, and quiet relieved, the pain. While sitting or lying upon the bed he experienced great comfort, that is to say, the pain was not so great, although he never was for a moment free from it. But standing or walking about, especially when the muscles were called into action, he suffered increased pain. His mother died in childbirth, from what was reported "inflammation of the bowels," most probably perimetritis; otherwise his family history was good, as a conversation with several members of it could not elicit any hereditary taint. He was six feet high, and on the whole had a powerful frame; was intemperate and careless about his person.

The symptoms, when first seen by me, were pain in the limbs, hip, and back; enlarged knee-joint, which was tender but not swollen or attended with heat; ankles enlarged, and the foot apparently subluxated; waddled in his walk—that is, his gait was uneven: shoulders thrown back; his arms swung loose about his person; urine high-colored, with deposits of uric acid; the pulse 82, full and strong; temperature normal, tongue pale, furred, and partially coated; bowels regular; appetite good.

Diagnostic points between osteitis and synovitis were: Pain was felt before swelling, in this case; with or after the swelling, in synovitis. The pain is subject to variations in osteitis, and constant

in synovitis. The most important symptom in this case was the relief that attended the reclining position, and the *apyretic* condition. In articular rheumatism, too, rest will relieve, but it is attended with swollen joints and fever.

When I first examined this patient, I was, like those before me, led into the belief, on account of this peculiar pain, that it was "chronic articular rheumatism," and gave him Dover's powders and nitrate of potassium, but with no good results. He complained of insomnia, and I prescribed morphia, which only aggravated the pain. I blistered the parts, which only gave relief as long as the surface remained broken. I then ordered iodide of potassium and wine of colchicum, but obtained no change for the better.

About six weeks from the time he was first seen I noticed two hard growths, one over the liver and one over the spleen. They appeared simultaneously and were attended with very little pain. Believing he had a congested liver and spleen I prescribed for him moderate doses of calomel for the purpose of gaining an absorbent effect. The tumors continued to enlarge although I had endeavored in various ways to destroy them.

About four weeks after they were first seen, it appeared as if there was one tumor divided into two parts, about on a line with the linea alba; and on examination by palpation, I obtained a distinct fluctuation. Thinking now, as no jaundice attended, that he was suffering from an encysted tumor I deemed it necessary to call several physicians in consultation, who, after a most careful examination, agreed that fluid was encased within the walls of the abdomen, and recommended puncturing with the trocar and canula. The operation settled the diagnosis, as nothing but a tuberculous matter followed the removal of the instrument, and the microscope gave us evidences of cancer.

I now placed him on a supporting treatment, and endeavored to alleviate his sufferings as much as possible. The tumor continued to increase in size, filling the entire abdominal cavity, and finally pressing upon the heart and lungs. He died on the 11th of January, 1879.

A post-mortem examination was held between the hours of one and four P.M., on the 12th, by myself and Drs. Asdale, Estep, and Barton, and gave the following:

He measured 50 inches around the waist. His maximum length was $76\frac{1}{4}$ inches, his minimum length was $74\frac{3}{4}$. The right tibia

17 inches; left tibia 16 inches. Right femur $22\frac{3}{4}$ inches, left femur $23\frac{1}{2}$. The pelvis was deformed, thus accounting for a variation in the length of the man. There was a spongy enlargement of the knee-joints. The joints were opened and accurate measurements made.

The vertebral bodies were enlarged and apparently spongy. The transverse and spinous processes were elongated; one of them, the seventh cervical, was fully three inches long.

The abdomen was opened from the ensiform appendix to the symphysis pubis, and along the line of Poupart's ligament from the symphysis pubis to the anterior spine of the ilium. The peritoneal cavity was completely filled with the tumor, which was discovered to be a cancer of the omentum, and was divided apparently into two parts by the foramen of Winslow. The intestines were pressed from their position; the vermiform appendix and cæcum occupying a position on a line with the linea alba, about one inch below the umbilicus. The ascending colon from this point took a direction upward to about four inches above the umbilicus, where it joined the transverse portion, which dipped directly downward to a point about opposite the eleventh dorsal vertebra, where it met the descending portion. This portion took a course along the abdominal aorta, deviating toward the left iliac fossa. The liver and spleen were normal, but pressed somewhat from their positions. The kidneys and bladder were also normal. The bladder was encroached upon by the tumor, which was encephaloid in character and weighed fifty-four pounds.

The spinal cord was not examined, but as there was no paralysis, not even a paretic condition of the surface, I did not think it was of much account.

Although seen by some of the best physicians, he was a puzzle to all who examined him. None knew with what they had to deal. The microscope, except to examine the matter following the trocar and canula, I regret was not used. This cancer, which was discovered by the microscopical examination, however, led me to study all the diseases that had any bearing upon the case. I never class a case, unless it is typical, and therefore could find nothing similar to the one I have related.

It was not until Dr. Asdale informed me that he consid-

ered it a case of the osteitis deformans attended with cancer of the omentum, that I obtained Guy's Hospital Reports for 1877. Mr. Bryant's case had so many symptoms which were similar to the case I have described that I was partially satisfied that it was a case of the osteitis deformans. Since reading Paget's cases I find but two features at variance; namely, the patient's age and the rapid growth and termination of the disease.

But I have explained this fully in another part, and hope that in the future consideration of the disease we may discover that it begins earlier but is unnoticed before middle or later life, when the bones become ossified and are more susceptible to changes.

REMARKS ON OSTEITIS DEFORMANS.

This disease is so rare, and the opportunity to study it so meagre, it is impossible to give an elaborate description of it.

It was first noticed and named by Sir J. Paget, Bart., in an extensive paper which he read before the Medico-Chirurgical Society of London, on the 14th of November, 1876, and published in their transactions the following year (vol. 60, 1877).

CASE 1, upon which he dwells at length, he first saw in 1854. He assigned no cause for the trouble, unless we admit the damp and cold locality where the patient lived. A sister died of chronic cancer of the breast, outside of which no hereditary diathesis existed. The patient's parents and grandparents had lived to an advanced age, and up to the time of dissolution enjoyed good health. The tibiæ, femora, pelvis, and vertebræ were enlarged, as in the case I have related, with the addition of the cranial bones, which in my case I failed to take note of. He was subject to aching pains in the thighs and legs, felt mostly after active exercise, although they never were severely painful, and had no tenderness on pressure. His mind was undisturbed; he enjoyed good health, and suffered very little.

Iodine, which has a remarkable power over syphilitic and rheumatoid affections, made him worse. (In fact, in all recorded cases treatment was of no avail, if we except the escharotic treatment, and even that relieved only so long as the surface remained broken.)

In twenty-two years his head increased from $22\frac{1}{2}$ inches in size to $27\frac{1}{4}$ inches. With all this growth it was not, however, misshapen. The spine was curved, so that he decreased in height from six feet one inch to five feet nine inches. The chest was contracted and narrow, and the movements restrained. The natural posture was strange and peculiar, and the attitude simian.

In 1870, the left knee-joint was for a time actively inflamed and its cavity distended with fluid. This was the only ante-mortem evidence of an inflammation, and it soon subsided, leaving the joint stiffer and more bent. At the same time he showed signs of valvular insufficiency, as in Mr. Bryant's case, with considerable atheroma of the aortic valves and vessels (which, however, can be credited to age, both patients being in the neighborhood of sixty years of age).

In 1872, his sight was partially destroyed by retinal hemorrhage, and at the same time he lost the partial use of his hearing, assignable in all probability to a hemorrhage also.

It was not, however, until February, 1876, that any thing of a vicious nature was discovered, when a firm medullary or osteoid cancer was seen growing around the left radius, and from a subsequent cancerous involvement of the lungs he died on the 24th of March in the same year.

His other cases are not so complete, but they follow much the same course, and two of them died of cancer: one of cancer of the upper part of the humerus, subsequent to amputation at the shoulder; another of cancer of the brain.

There are in all recorded cases an increase in the quantity and a degeneracy of the bone-texture, and in three out of five cases carcinomatous disease complicates—the other two cases still living at the time of report.

Sir James Paget thinks it begins in middle age or later, and is very slow in progress. This is, perhaps, the rule, but the case I have described is an exception to it, he being

only eighteen years old when he first noticed his trouble (which was attributed to rheumatism), and only twenty-one years old when he died. I consider, however, this rapid termination was brought about by the cancerous invasion which was unnoticed four months before death.

In osteitis deformans there is a gradual enlargement of the bone, affecting all the bones of the body excepting the facial and phalangeal bones, attended with no fever or disturbance of health. Later in the history of the disease the special complication seems to be cancer. Heredity appears to play no part in the etiology of these cases.

Early in the disease pain of an obscure kind, simulating rheumatism, is present, aggravated while the patient is exercising. Mr. Bryant considers this pain to be caused by the yielding of the softened textures. My impression is that it is located in the region of muscular attachments, as it is not so severe even while standing as when the patient moves about. This symptom I think important, as it goes a good way toward proving the inflammatory nature of the disease.

The patients have usually a simian attitude. It was not, however, the case in the one I have described, Still I attribute this partly to the large tumor and partly to the bones not suffering the marked degeneration as in Sir James Paget's and Mr. Bryant's cases. His legs were bowed; and while sitting, semi-extended, as in the cases above.

Sir James Paget's reason for calling it inflammatory is remarkable; and while I do not fully agree with him, yet I am at a loss to give a better one. The softened texture, with nature's endeavor to restore the affected parts, together with the symptoms above quoted, can point to no other known cause. That there is a change in the nuclear formation is evident by the irregular increase in the quantity without a

corresponding increase in the texture of the bone. This is the result either of an obscure osteitis, or else the bones receive a stimulus the nature of which we do not understand.

The causes are obscure or unknown. In the case I have related I might infer a concussion of the bones sustaining the weight of the body. That a fall from a height will produce concussion, if not a fracture, is as plausible as that a blow upon the cranial vault will produce concussion of the brain, or a sudden downward fall, as upon the nates, will produce concussion of the spine. This cause must be ruled out, however, from the fact that all the bones of the body, with the exception of the phalangeal and facial bones, are involved in the general degeneration. This is also why the inflammatory nature of the disease is doubtful. It is the only reason. There is an intemperate habit in the case I have described, which I flattered myself might have played an important part in his trouble. He was between the ages of seventeen and eighteen years when he received what is supposed to be the cause of his complaint, before the epiphyseal ends had united with their shafts ; and on account of his powerful frame, was subject to a greater labor than his age permitted. These two factors, in connection with the intemperate habit, would stimulate nature to rebellion. But Sir James Paget's and Mr. Bryant's cases set this aside by reason of their temperate habit and corresponding life.

In the study of osteitis deformans there are several diseases of the bone which are to be examined in connection with it. It can, however, be easily diagnosicated, if we hold strictly to the fact that it is an increase in the bone with a softening of it; or, as Sir James Paget expresses it: "The structure appears to have been almost entirely removed and laid down afresh on a different plan and a larger mould." In endeavoring to class my case with them I soon discovered the vast difference.

Rachitis is an affection of early life, and invariably presents a history that dispels all doubt of its nature. There is instead of an apparent hypertrophy a general atrophy of the bones affected.

In osteomalacia there is a general softening in which the bones become brittle and break, and the epiphyseal ends become swollen. It mostly affects child-bearing women, and presents a cause which will aid in arriving at a correct diagnosis.

There is a group of hyperostoses I must mention in connection with this trouble, which are the result of an increased supply of blood or lymph from an active inflammation of an adjacent part. Sir James Paget claims they are not signs of the disease proper to themselves, and occur in the young alone. They present a healthy texture, that is, an increase in the quantity with a corresponding increase in the texture, and, with the exception of the tibiæ, the bones do not become deformed.

Osteoporosis, another affection of the bone, I was inclined to accept, but it being a disease of the bones where the compact tissue becomes porous, while in the osteitis deformans, although the Haversian canals and the lacunæ become larger, yet there is a corresponding increase in the bone (texture).

The above diseases have but one feature in common with the osteitis deformans; namely, the bending of the bones from weight of the body.

Doctor Daly reported a case in the *Medical Record* for February 28, 1880, which he calls elongating hypertrophy, or Paget's osteitis deformans.

To the observant mind it is easily recognized as a disease of a strumous nature. He has evidently not read Paget's paper, or has failed to recognize the prominent feature of the osteitis deformans, which I have quoted above.

The history of the child, its age, and the fact of the mother being unable to raise any of her children, point conclusively that it was suffering from a cachexia of early life.

A word more upon measurements: In examining the surgery in the Pennsylvania Hospital, we find that asymmetry is the rule and not the exception of the lower limbs.

That cancer should complicate where there exists no hereditary diathesis, is a fact worthy of notice. I can shed no light upon it, unless I may be permitted to suggest that it may be due to a germ latent for several generations from some ancestor unknown to the living; the same as syphilis is known to remain latent in one generation to show itself in the next.

The prognosis, while it is not the best, is nevertheless not bad. Unless carcinoma attends, the disease is not fatal, while at the same time it cannot be reached by treatment.

METALLO-THERAPY, THEORETICALLY AND PRACTICALLY CONSIDERED.

By GRACE PECKHAM, M.D.,

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PART I. — METALLO-THERAPY, THEORETICALLY CONSIDERED.

IN France the claims of metallo-therapy are sufficiently well recognized. The subject has been thoroughly discussed in the French journals, which for the past five or six years have teemed with articles concerning it, and reports of cases.

"Metallo-therapy is no more denied," says Charcot.[1] "It is a question solved; the facts have been methodically established, and they now remain an acquisition to science."

"The experiments," affirms Vigoureaux,[2] "have been daily repeated on an enormous number of patients of both sexes in ordinary practice, as well as hospital; and these observations have resulted in a body of doctrine as well defined as that found in any other department of physiology. The results obtained are directly due to the application of these agents, and are united by certain laws to the conditions of the organism."

In America, few have given any attention to the subject; and very little beyond the reports of a scanty number of cases has been written about it. To many of the profession who are not neurologists, the word metallo-therapy

[1] *Gaz. des hôp.*, 1881, p. 1199.

[2] Quoted in *Journal of Mental Science*, Jan., 1879.

conveys little meaning. Its mention is often accompanied with a shrug of the shoulders and a sceptical smile, and there are those who regard it as a resurrection of ancient cabalistic and astrological practices addressed to the imagination of the patients. That this should be so is not strange, when the peculiar history and the peculiar results which baffle the theorist are taken into consideration; as well as the fact, that few have troubled themselves to put it to a test. The whole subject forms one of the most singular and striking chapters in the art of healing.

Definition.

Metallo-therapy is used to designate the employment of metals, externally and internally, in the healing of diseases in which they have been found serviceable.

In a broad sense of the word it also includes weak electrical currents,[1] solenoids, statical electricity, and magnets, because in very many instances the results have been strikingly similar; and the theories brought forward to account for the effects of the one seem to account for those produced by the others.

In its broadest sense the latitude of its meaning has been extended to embrace all the natural agents and processes, to which Charcot has given the name *æsthésiogène*, which, like metals, have a specific action on the sensibility and various other functions.

History of Use of Metals.

The use of metals in disease is no new thing. Aristotle, Galen, Alexandra de Tralles, Paracelsus, and other celebrated physicians of antiquity, ignorant of the scientific aspect of the question, attributed the efficacy of their remedies to the magic inscriptions which they bore.[2] In the

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[1] Insulated coil of wire connecting two poles of a single element.

[2] *Brain*, vol. i, 1878, p. 331.

eighteenth century metals attracted attention, together with animal magnetism, and one finds in connection with their use the names of Lenoble Mesmer, Barea, of Vienna ; Osterwald, Director of the Academy of Science at Munich. In a report addressed to the Société Royale de Médicine de Paris, the commissioners, Mauduyt, Andry, and Thouret, gave testimony to the good effects obtained by the application of metallic plaques to painful points.

Wichmann,[1] in a work entitled "Ideen zur Diagnostik," published in 1778, relates the history of an hysteric in whom contractures and convulsions were calmed instantly on the external application of iron. He was sure the action was not due to temperature or pressure, since no other metal would produce the effect. Wicke, in 1844, gave pictures of the attempts to use metals made by different ones, especially by Sachs, who was the editor and commentator of Wichmann in 1827. These experiments fell into oblivion.[2]

In 1820 Despine, who was interested in hysterical and other nervous affections, while resorting to magnetism to determine the difference between organic and functional disease, was led to study the different effects of metals. He was not slow to recognize a certain relation between metals and electricity, and stated that the remarkable curative effects produced by metals applied to different parts of the body, in patients suffering from certain hysterical affections, were of an electrical nature.[3] He found a special susceptibility to gold in the sick, and a different influence upon them of copper, zinc, and gold. Different patients described the effects in the same words, and from his observations he was led to believe that they depended on some

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[1] *Bull. gén. de thérap.*, 1879, t. xcvii. Sur la metallo-thérapie, par L. H. Petit.

[2] *Compte rend. d. soc. d. biol.*, 1877, and *Gaz. des hôp.*, mars 7, 1878. De la metallo-thérapie et metalloscopie, par Charcot.

[3] "Observations de méd. pratique faites aux bains d' Aix, en Savoie," par C. H. A. Despine, père. Edité chez Aime Burdet, Annecy, 1838, p. 124,

natural and positive laws, which have not yet been observed; that they are not produced at hazard by the caprice or deception of the patient, but that these laws which govern them are as immutable as those which govern the universe. In his work he cites a number of interesting cases to substantiate his statements.[1]

To Dr. Burq[2] belongs the honor of placing metals among recognized therapeutical agents. He observed that persons in the somnambulistic state of animal magnetism had a pleasure in certain metals, as gold and silver, and an aversion to others, copper in particular. This fact had been also noticed by others: Fisher in 1805, Richet before that time, and Despine in 1820. He insists that this was all these men claimed, and that they never experimented in metallo-therapy out of the magnetic state.[3]

An hysterical patient who had been hypnotized was ordered, while still in that condition, to leave the room to return to her bed in the ward. She obeyed, walking with her eyes shut until she reached the closed door. Upon seizing the knob, which was of copper, she uttered a great cry.

No especial significance was attached to the matter until it was recalled thirty-five years after, in 1847, when another patient in a state of artificial somnambulism touched a brass knob in opening a door. She was seen to approach it cautiously, and after her fingers had come in contact with it, to rub her hand upon her skirt as if she had touched something warm. When asked why she did so, she replied that contact with copper made her ill, that this metal burned like fire, and that was why she rubbed her hand after touching it. Several *sous* placed in her hands made her rub them against her garments very quickly. "But," said the experimenter to her, "you wear a medallion about your neck that you do not take off." "That is different," she replied; "it is silver, and I like the touch of silver and gold."

[1] *Lyon méd.*, juil. 18, 1880, xxxiv. La metallo-thérapie en 1820, par le Dr. J. Monard.

[2] "Des origines de la metallo-thérapie," par M. le Dr. Burq. *Gaz. des hôp.*, 1882.

[3] *Lyon méd.*, dec., 1880. La metallo-thérapie depuis 1850. Répons a MM. Despine et J. Monard.

The patient was put into a profound sleep to prove that the effect was not due to imagination. It was found that contact of the metals produced the same result; as was the case when experiments were tried on different days.

The effects were more striking when the size of the object used was increased. When a candlestick or saucepan of copper was placed in bed at a distance of 20 to 50 cm. from the body, she became oppressed, repelled it, and became angry at the attempts made to keep her in its neighborhood. Afterward, when this patient was sick in bed, sensibility having been abolished by magnetism from an arm, a *sou* was placed upon the external portion of the middle of the forearm, which, after three or four seconds, she would always throw off. Pricking with a pin showed the return of sensibility under the *sou* and in its neighborhood. The arm was reanæsthetized, and silver and gold were tried without effect.

Another experiment was to make the arm cataleptic and rigid, and then to apply copper. After several seconds the muscles became supple, the anæsthesia disappeared, and the member recovered its liberty. The same application of silver and gold availed nothing. Steel gave the same effect as copper, but not as rapid.

After the death of this patient, Dr. Burq made the same experiments on others and obtained the same metallic phenomena, the same attractions and repulsions, and the same subjective phenomena. Copper alone, or alloyed to form brass or bronze, was always pushed away and invariably caused a return of sensibility or a relaxation of a contracted muscle. Steel and iron were tolerated by certain subjects, while an alloy of gold produced repulsive effects. It was also found that applications of copper were efficacious in certain isolated spasms and in trismus supervening on the magnetic crisis. Muscular weakness disappeared equally with anæsthesia.

The case of Pauline, at the Hospital Cochin, is famous in the history of metallo-therapy.

She was affected with absolute amenorrhœa, a general paralysis

which confined her to her couch almost constantly, a complete paralysis of the bladder necessitating catheterization five or six times a day. Other treatment having failed, in despair animal magnetism was attempted. On the first day of this treatment, the patient, upon awakening, was attacked with various thoracic spasms. One evening these were of peculiar violence. To cut them short, a large plaque of brass was applied to the epigastrium. Less than two minutes after, suffocation, palpitation, and vomiting ceased, and she slept calmly during the night. In two or three days the same symptoms re-occurred, and the same effects were obtained with brass. After several moments of great calm, the plaque was removed, and very soon the thoracic spasms were renewed with all their first intensity. When the disk was returned, the calm which ensued witnessed authoritatively to the anti-spasmodic effect of the copper.

Every fourth day, at night, Pauline had a severe attack, which was accompanied by complete loss of consciousness, and which lasted several hours.

On one of these occasions it required five persons to hold her upon her bed. The expenditure of nerve force was prodigious. It seemed as if the muscles of the frail creature, almost paralyzed in their ordinary state, could not contract with such energy without rupturing them. The spasms subsided upon the application of copper plaques. The violence ceased, and the patient recovered consciousness.

Dr. Burq recommended the use of copper plaques applied over the abdomen, to relieve the cramps and spasms of cholera; led to believe they would be efficacious from the facts that workers in copper experienced an immunity from the disease, and that this metal was useful in cases of hysterical spasm. It proved very successful as employed in the cholera wards of various hospitals in the epidemic of 1849.[1]

Now thoroughly convinced that he had made a valuable discovery in therapeutics, Dr. Burq went to the Hospital of Salpêtrière to further prove and test it. He first tried it in the epileptic wards without success. The attacks continued as if no metals were used. He next experimented with five patients who were confirmed cases of hysteria.

[1] *Gas. des hôp.*, nov., 1849. Leçons cliniques de Rostan sur le choléra.

Belts and bracelets of copper placed upon them gave almost immediate effects. Anæsthesia disappeared. Upon the fourth the results were almost negative. On the fifth there was no change. Whenever a crisis appeared, the first three resorted to the metals, and during the first month the attacks became less frequent. At the end of two months Dr. Burq was obliged to leave the hospital on account of business. Upon returning after an absence of six weeks, he found that they had had no more attacks. They were cured by four applications after he left.

Sylvain, the fifth, alone remained unaided. All attempts to affect her with copper were unavailing. She laughed at pin-pricks, no matter how deep. One day (March 2, 1850) she was found sewing with an iron thimble. The idea occurred to Dr. Burq to test the sensibility of that finger. She uttered a loud cry upon being pricked. The other fingers were insensible. Placing the thimble in turn on the other fingers and thumbs, in ten minutes the sensibility returned. Substituting a copper thimble for iron, the anæsthesia remained.

This experiment established the fact of polymetalism in the place of monometalism.

For twelve years Dr. Burq went about among the different hospitals, experimenting at L' Hôpital Cochin, Val de Grâce, La Salpêtrière, L' Hotel Dieu, Maison Dubois, Necker, and others; but the new therapy was received with silence and disdain. Of this period, he says pathetically: "Despairing of success, I ceased my peregrinations to the hospitals, gave my pen repose, and sought diversion in other work."

Reports of the Commission of the Société de Biologie.

In August, 1876, Dr. Burq applied to the Société de Biologie to appoint a commission to study the results which

were obtained by the application of metals to the cutaneous surface. MM. Charcot, Luys, and Du Montpallier[1] were appointed, and after the most careful and elaborate experimentation, they presented their report. It was read April 14, 1877. It established the following facts :

I. That the application of certain metals to the skin of hysterical and anæsthetic patients, and in several cases of organic lesions, determines important modifications of which the principal is the return of general and special sensibility.

II. All patients are not susceptible to the same metal, gold, iron, and copper giving results positive or negative according to the patients submitted to the experiments.

III. The phenomena observed after the application of the metals are produced in the order established by Dr. Burq, viz: The patients feel at first at the point of application of the metals and in a zone more or less extended, pricking, a sensation of heat; then shortly in the same region there appear a redness, a return of sensibility, increase of temperature measured by the thermometer, and at last a return of muscular force measured by the dynamometer.

In the course of these experiments it was further discovered that very weak electrical currents produced a return of sensibility; and also that there was a transfer of sensibility from one side of the body to the other, under the influence of the applications of metals or continued electrical currents.

A second report was given by the same committee,[2] August 10, 1878, which established the second proposition of Dr. Burq: that the aptitude of the patient having been determined by external application of metals, the internal

[1] Étude experimental sur la metalloscopie et metallo-thérapie du Dr. Burq. Premier rapport.

[2] Étude experimental, etc. Second rapport.

administration of the same metal would determine the same results.

To thoroughly appreciate the labors of this committee, a perusal of the whole report is necessary.

The prize of Ernest Godard was bestowed upon Dr. Burq, and he received a greater and more coveted boon, the recognition and respect of the scientific world, for his discoveries in metallo-therapy, for which he had waited nearly thirty years.

Phenomena of Transfer, Oscillation, and Fixation.

The phenomena of transfer, which was discovered during the experiments of the commission, is one of the most surprising facts connected with metallo-therapy. M. Gellè, in testing the hearing in the hysterical patients, found that while the hearing of the affected ear, after the use of metals, was improved, that of the ear of the opposite side was decreased by just so much as the other had gained. Landolt discovered, in cases of achromatism, when the power of distinguishing certain colors had returned in the affected eye, it disappeared correspondingly in the other. In the same way there was a transfer of sensibility, temperature, and muscular power.

After the transfer, there is a return of anæsthesia to its accustomed seat, and of sensibility to the normal side. This was called by Dr. Burq "the anæsthesia of return," and when it appeared the experiment was at an end. But Charcot has found that there is a succession of spontaneous transfers following the first one, each lasting very nearly the same time as the first. The number depends on the person and the æsthésiogène used. The transfer is not complete, one side gaining what the other loses; the result is an accumulation of these differences. To these successive transfers Charcot has given the name oscillations.[1]

[1] *Arch. de neurologie*, vol. i, 1880.

Transfer is not always present, and generally takes place in the patients affected with hysteria, and not in those under treatment for organic disease.

Simple excitation of the surface of the body, as with a sinapism, causes an increase of sensibility at the point of application, and a diminution of that at the symmetrical point of the other part of the body.

Adamkiewicz[1] and Adler[2] advance the theory to account for the phenomena of transfer, that certain of the bilateral functions of the body, performed by symmetrical organs, are presided over by symmetrical ganglionic centres, which are antagonistic, the one to the other, in the exercise of their functions.

In testing to ascertain the susceptibility to metals, it had been the practice to place the different kinds at different places on the anæsthetic part at the same time. The metals under which the sensibility had returned were the ones to be used in the case ; the others, under which the sensibility had not been aroused, were considered ineffectual. The former metals were called "active" for that case, the latter "inactive" or "neutral." While experimenting in this way it was found that if an inactive metal were superimposed on an active metal, or placed anywhere between it and the central nervous system, the phenomenon of transfer and the return of sensibility would not take place, if the two metals were put on at the same time ; or if the active metal had caused a partial return of sensibility, and the inactive metal was then used, the area of returning sensibility would remain the same, and not increase as it would have done had not the inactive metal been used.[3] In this

[1] *Arch. f. Anat. und Physiol.*, 1880, p. 159. Ueber bilaterale Functionen.

[2] Ein Beitrage zur Lehre von dem bilateralen Functionen im Auschluss an Erfahrung der Metalloskopie. Inaug. Diss., Berl., 1879. *Brit. Med. Jour.*, May 10, 1879.

[3] *Bul. gén. d. thérap.*, *loc. cit.* *Brit. Med. Journ.*, 1879, Nov., p. 767. Dumontpallier. *Arch. d. neurol.*, vol. i, 1880 : metalloscopie, metallothérapie, æsthésiogène, par Vigoureaux.

manner, not only the effects of metals, but those of magnets and electricity, can be prolonged at will. The neutral or inactive metals will be found to be those which rarely produce results.[1] The theory advanced to account for this curious fact of arrest or fixation will be discussed farther on.

Discussion of Theories.

I. EXPECTANT ATTENTION.

That the effects observed in metallo-therapy are due to expectant attention is a theory which has, naturally, been most often expressed. When Bennett found that non-metallic bodies would produce the same results in some instances as metals, and when Westphal and others found that sinapisms caused a return of sensibility and the phenomena of transfer, it was thought by many that proof positive had been obtained, that metallo-therapy simply appealed to the imagination.

Bennett, after experimenting on several cases, came to the following conclusions:

1. The phenomena (for he had obtained them) occur in hysterical patients prone to sudden changes.

2. None of the effects are inconsistent with what is well recognized as the influence the mind possesses over the body.

3. Anæsthesia and analgesia are changing and varying symptoms.

4. Metals have been used for a long time in an uncertain and inconstant manner.

5. No metals equally suitable.

6. Disks of wood do as well as metals.

These results led him to conclude that metallo-therapy was of mental rather than physical origin.[2]

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[1] *Prog. méd.*, 1878, juil. 27, p. 573.

[2] *Brain*, vol. 1, 1878, p. 331. *British Med. Journ.*, 1878.

Aigre [1] was also of this opinion, as was Beard, who, having tried it in a number of cases, announced his conviction that organic affections can often be relieved by a mental influence better than by medicine; and that functional diseases of different kinds can be healed in this manner.

It has also been suggested that the results may be due to the personal influence of an individual rather than to the effect of the metals upon the system.

To most who have thoroughly studied the subject it would be exceedingly difficult to credit personal influence, or attention, suggestion, and imagination, with the unexpected results obtained.

In the first place, the application of metallic disks appeals less to the imagination than almost any form of external treatment. Less imposing than the buzz of the faradic battery, less impressive than a collection of galvanic cells, it has had effects where these have been persistently tried.

The patients often say: "You do not expect these (referring to the disks) to do any good?"

In the second place, healing occurs when the patient and the one applying it least expect it. Experimenters have applied a metal, thinking that they had a certain one when they had not, and discovered their mistake only when they found that the usual effects were wanting.

Thirdly, patients in Germany, France, England, and America, and in widely different circumstances, have expressed the effects of the metals in the same words, and the same results have been obtained.

Fourthly, how could a theory of imagination or expectant attention account for the phenomena of transfer, especially when occurring in cases of achromatopsy, or in the hearing? How could it account for the fixation or arrest by a neutral or inactive metal?

[1] *Thèse de Paris*, 1879.

Fifthly, the application of metals on healthy individuals, while negative so far as yielding any results from which to deduce conclusions, proves that there are effects, since in some there is an augmentation of the sensibility, in others there is a diminution, while in still others there are no results.[1]

Sixthly, experiments on animals are more conclusive.[2] Vierordt tested the susceptibility of frogs to metals. He removed both cerebral hemispheres, and after fifteen minutes he applied the metal to the abdomen and occasioned a return of sensibility, which had been lost. He used zinc and lead. He calls attention to the fact that the experiments were performed in November and December, when the excitability of the frog is much less than at any other time of the year. Schiff experimented with negative results in the frog; but in dogs, where a lesion had been made in that part of the hemisphere which corresponds to the anterior paw, so that there was no excitability to touch or tickling, a solenoid in fifteen or twenty minutes caused a very marked excitability which lasted five hours. When centres for both fore and hind paws were affected, sensibility returned in both members when the magnet was applied to the forepaw, which remained three or four hours.

He states that the experiments correspond to those on man. In one of his cases of hysteria he used artificial magnets from which he could turn off the currents at pleasure. Periods of the return of sensibility were the same as when the current was on.

To the statement that, since non-metallic bodies produce the same effects, the results must be due to expectant attention, Vigoureaux responds that " it is claimed that a certain number of physical agents produce invariably the same

[1] *Bul. gén. d. thérap.*, *loc. cit.*

[2] " Metalloscopy of Frogs." *Brit. Med. Jour.*, 1879, p. 159, and *Centralbl. f. d. med. Wisschft.*, No. 1, 1879.

series of phenomena in question, while other agents, or the same in other conditions of intensity, never produce them. Whether disks of wood, or the same disks under different conditions, do not produce the same results, is a matter of secondary consideration."[1]

2. ELECTRICAL THEORIES.

The commission appointed by the Société de Biologie had found by the aid of delicate galvanometers that exceedingly weak currents were generated in the zone of the application of metals. The needle indicated 2° to 10° for gold; 8° to 15° for copper. They also found that the direct action of a current of 2° to 10°, in patients who had a susceptibility for gold, gave the same result; and a current of 34°, in those sensitive to copper, produced like effects. If the metallic idiosyncrasy was known, a current of the same intensity as the metal could be substituted, and analogous results, return of sensibility, elevation of temperature, and a return of muscular force, could be obtained.

Marigliano and Seppilli repeated the experiments performed by MM. Charcot, Gellé, and Landolt, in relation to the influence of electrical currents the magnets on anæsthesia, and arrived at the following conclusions:

1. In hemianæsthesia, the application of electrical currents, or metallic plaques, or of magnets determines not only a return of general sensibility, but also that of special sensibility.

2. In hemianæsthesia of cerebral and organic origin, the return of sensibility caused by these different means extends not only to the zone of application, but also to all the anæsthetic portion of the body.

3. In hysteria, the return of sensibility of the anæsthetic side coincides with the disappearance of the sensibility of the sound side, and that in a zone perfectly symmetrical.

[1] Quoted by Petit. *Bull. gén. de thérap.*, *loc. cit.*

4. The duration of the return of sensibility is more persistent in the cases of organic than in those of functional anæsthesia.

5. It is probable that the different means which determine these effects all act by means of electrical currents, which in their turn act on either the vaso-motor fibres or more especially on the sensitive fibres.[1]

Onimus thought that possibly metals acted on the electro-capillary currents of the system, but afterward agreed with M. Rabateau that the development of electricity was due to a certain degree of oxidation of the metals, which takes place when they are applied to the moist skin; that the metals were not chemically pure ; that every metallic plaque, not chemically pure and undergoing oxidation, was an electrical element; and that it was an electrical action to which one must attribute the effects obtained.[2]

Eulenburg, as well as Regnard, found that a current is engendered by the contact of the skin with metallic plaques, which vary in force and direction according to the metal employed. He repeated Regnard's experiments with great care, using non-polarizable electrodes. He found that the metallic plaques, placed on different parts of the skin of certain individuals, gave varying results; and that different metals varied greatly. Zinc, which with some persons is stronger than gold, is much weaker in others. Moreover, he found the currents generated, different on different days. He attributes the variation to the chemical nature of the cutaneous secretion, which is subject to exaggerations in nervous affections. To prove this, he placed dry paper between the skin and the metal, which caused an arrest of the current. If the paper were saturated with salt, the current was of greater intensity.

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[1] Rivista sperimentale di Freniatria, anno iv, fascicolo 1, 1878, p. 36.

[2] Rapport d. com. de soc. d. biol.

Gold and platinum, chemically pure, were found almost without action, both by himself and Regnard, and they both state that they pass equally for having little therapeutical action.[1]

Bocci[2] also upholds the chemico-electrical theory.

If only the effects of metals, weak electrical currents, and magnets were to be accounted for, the electrical theory would satisfy those who accept metallo-therapy as resting on any scientific basis; but it has already been stated that Bennett and others[3] with disks of wood, and Westphal with sinapisms and disks of bone, obtained a like result. Schiff found that wet compresses of thick woollen cloth, as well as sinapisms, caused a return of sensibility.[4] Thermes could produce it by means of hot and cold douches. Other ex-

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[1] *Deutsche med. Woch.*, June 29, 1878.

[2] Bocci used the ciliated epithelia of the œsophagus of the frog to demonstrate the action of metals. He employed the graphic method, and obtained tracings indicating the rate of movement of a foreign body urged on by the cilia, which, as is known, are capable of propelling an incredible weight down the œsophagus to the stomach. As the cilia continue to move a long time after the death of the frog, he removed the œsophagus from the palate to the stomach, laying it open so as to expose the superficial surface of the lining membrane, and placed it on an instrument so that any movement could be recorded by a lever writing on a revolving cylinder. He used thin and polished strips of metal, upon the size, not weight, of which he lays great stress. They must be 15 mm. long by 3½ mm. wide; 1, or less than 1, mm. thick. He introduced two thirds of such a strip carefully under the stomach-end of the œsophagus.

He found that certain metals, which he named "excitor"—gold, copper, silver, and platinum,—increased the power of the cilia; others, the "inhibitory"—zinc, cadmium, and bismuth,—lessened it; while another group, the "indifferent" metals—tin, iron, and lead,—had no effect.

The action of the metals, continued from two seconds to one or two minutes after their removal. This he called their residual action. He also found that after the metal was applied the cilia had unusual motions: the vibratile wave, which is always in the direction of the stomach, would be reversed, or the cilia would not be in accord. The microscope, as well as the tracings, showed this very plainly.

He advances the frail hypothesis—frail since it is based on the still uncertain histological anatomy of the ciliated cell,—that the action of the metals is on the contractile substance which forms a swelling at the base of the cilia, upon whose physico-chemical processes he supposes the movements of the delicate filaments may depend.—*Riv. clin. di Bologna*, 1882, No. 9: Nuove Ricerche sull' Epitelio e Contributo alla Metallo-magneto-xilo-scopia.

[3] Dr. Desquin experimented with woods, and found that certain had æsthesiogenic properties, while others had not. Peruvian bark, rosewood, and pitchpine aroused the sensibility. Poplar, sycamore, and ebony had no action. *Rev. mensuelle d. méd. et d. chirurg.*, juin 10, 1880, p. 402.

[4] *France méd.*, 1879, xxvi.

perimenters have brought about like effects with ivory and glass.

If, then, disks of wood, ivory, bone, glass, wet compresses, hot and cold douches, could provoke the phenomena of metals as well as weak currents and magnets, it was evident to the investigators of the subject that an electrical theory of wider application than that held by Rabateau and Onimus, Regnard and Eulenburg, must be resorted to; therefore to meet this demand the thermo-electric theory was advanced.

Non-metallic as well as metallic bodies in contact with the skin determine changes of temperature. DuBois Raymond has demonstrated that thermo-electric currents can be produced by the inequalities of temperature that one would not believe generally capable of possessing this influence; and that other causes difficult to discover can give birth to currents and to an electro-motor action. Each body affecting differently the cutaneous surface should give birth to currents of varying intensity.

Vigoureaux,[1] in reply to the electro-chemical theory, declares that the chemical action of the metal upon the skin is not an essential condition. It is not necessary to have a current to obtain the modifications under discussion. He has proved this by the use of a pile well isolated, and the application of a single pole, which produced the same effect as the current itself. When both poles are used, the same unipolar action takes place at two different points. He believes that the phenomena of metallo-therapy are brought by a greater or less variation, during a variable time according to the subject, of the electric tension on a limited portion of the body. Physicists admit that simple contact is a source of electricity; and that two metals charge themselves

[1] *Gaz. méd. de Paris*, Dec. 14, 1878, p. 620. Sur la théorie physique de la metalloscopie. *Arch. d. neurol.*, 1881–2, ii, p. 92.

with different kinds of electricity independent of all chemical action, as do also a metal and a liquid. The electromotor force so developed varies according to the nature of the bodies in juxtaposition.

He concludes that an electrical state determined to the peripheral organs of general and special sensibility, is necessary to the exercise of these functions; and that one can modify this electrical state, and consequently the sensibility, in determining to the surface of the body a phenomenon of tension. That which can do this is the application of metals, of polarized plaques, electricity by a single pole, and the electrical current.

The electro-chemical theory could not account for the fact that the effects produced by an active metal can be fixed or arrested by a neutral metal placed upon it or above it.

For example[1], a piece of silver placed on a piece of gold has been seen to arrest its action. As the skin and silver did not come in contact, the result could not be on account of the action of the cutaneous secretion upon the silver. The effect of the superimposed plaques comes under the law of tension, which the tissues obey, as do several solutions of chlorides and sulphates. According to this law, the total tension which results from a series of contacts is the same which will be given by the direct contact of the two extremes of the series. The skin and the metals are in effect two metals.

Combine this theory of Vigoureaux's with the thermo-electric theory, to account for the effects of non-metallic substances, and the ground of causation of the phenomena of metallo-therapy is covered.

3. THEORY OF MECHANICAL IRRITATION.

Adamkiewicz and Adler[2] attribute the effects to the

[1] Compte rend. d. soc. d. biol., 1877, p. 462.

[2] *Loc. cit.*

mechanical power of irritation, and not to the electrical currents. They both think their position is proved from experiments with mustard poultices, which they give in detail, after the use of which there was a greater return of sensibility than with the metals, with also the phenomena of transfer.

4. SCHIFF'S MOLECULAR THEORY.

Schiff[1] felt compelled to discard the electrical theory as insufficient to account for and explain all the facts which a careful investigation of the subject revealed. In the contact of a metal and the skin, the enormous resistance of the latter and the exquisite conductibility of the former render these currents so feeble and transitory that one could not attribute to them the production of the physiological phenomena in question. He fell back upon a broad and comprehensive basis of a modification of the molecular motion, a theory which he presents in a pleasing and attractive manner. Very probably, says Schiff, the molecular movements vary according to the density, specific heat, electrical state, and other properties, and that from this arises the difference of physiological action. One can suppose that the molecular vibrations of a solid only act on the sensibility of an animal when their rhythm has a certain affinity with the molecular movements of the nerves in action; the same as a cord vibrating only causes another to vibrate when the vibrations reach a certain determined figure. One can admit that in hemi-anæsthesia there is a molecular modification of the nervous system that does, and probably always will, escape anatomical investigation. Let one imagine, he continues, that in hysteria the nerve-molecules are more mobile than in the normal state, and that in a point of the nervous axis between the spinal cord and a

[1] *Arch. d. sciences physiques et naturelles*, Genéve, 1880; and *Bul. gén. d. thérap.*, 1880. De la metallo-therap., par Dr. Noel de Mussey.

part of the nerve-fibres there arises, from an unknown cause, an anomalous molecular condition, which hinders the transmission of the movements which produce sensation. If then there is directed on the injured part vibrations of a determined form, the nerve-molecules coördinate themselves harmoniously with the connecting nerves, and take a regular disposition, but in a state of unstable equilibrium. They offer then an irregular dynamic state.

In regard to the internal use of metals, Garel, who has made an extensive study of the subject, comes to the conclusion, that as the digestive mucous membrane is a kind of internal skin possessing nerve-terminations susceptible of modification, any theory which would account for the external action of metals would account for the internal; both act in the same way. He thinks the results of metals due to contact, and probably of an electrical nature.[1]

Conclusions.

In view of the arguments already enumerated, as well as the facts of metallo-therapy, which will be discussed at greater length, and illustrated with reports of cases, when the practical side of the question is considered, the theory of expectant attention must be set aside as wholly inadequate to explain the surprising phenomena witnessed.

The electrical theories are far from satisfactory. The chemical action of the secretions of the skin upon the metal would be plausible, if only metals produced the results.

Vigoureaux's theory of electrical tension goes farther, and accounts for arrest or fixation of effects.

The thermo-electric theory relieves the perplexity incident upon the discovery that non-metallic substances produce the same results as metals.

[1] *Lyon méd.*, juil. 4, 1880, t. xxxiv.

Schiff's theory of molecular motion and change of rhythm satisfies the imagination, and sounds logical, since it is in unison with the generally accepted beliefs held in regard to generation of nerve-force. It leaves no possibility for disputation, since he passes beyond the realm of what can be seen and measured by the senses.

Then, after all, the explanations advanced are little better than hypotheses. The difficulty of constructing a tenable theory is sufficiently recognized by all investigators of the subject. A knowledge of nerve force less shadowy and ill-defined than that of the present must be obtained to furnish the corner-stone that is lacking.

EDITORIAL DEPARTMENT.

THE GERM THEORY OF DISEASE.

THE great and ever-growing interest in the question of the relations of vegetable germs to disease has, during the past few years, multiplied the literature of this subject to such an extent that it is difficult, nay, almost impossible, for the general reader to keep himself as well posted as he might desire on this most important subject. For of its importance, who will doubt? It is a question of interest not merely to the physician, but one of the greatest weight to society at large; and it is certainly worthy to rank, along with Cohnheim's discovery of the process of inflammation,—that riddle which had baffled the attempts at solution for thousands of years,—as one of the first medical, or, to put it on a broader basis, biological discoveries of the nineteenth century. We gladly welcome, therefore, two works[1] which, within a moderate compass, give a good synopsis of the present state of our knowledge on this subject.

Though some of the older investigators, as Leeuwenhoeck and Spallanzani, investigated the nature of putrefactive processes, and made discoveries that were forerunners to our present knowledge, yet the real science of mycology, in its relation to disease, dates from the middle of the present century. In 1848 Fuchs discovered micro-organisms in the blood of septicæmic

[1] See under Book Reviews: "Bacteria and the Germ Theory of Disease," by H. Gradle, M.D.; and "On the Relations of Micro-Organisms to Disease," by Wm. T. Belfield, M.D.

animals; and Brauell and Davaine in 1849 and 1850 observed the anthrax bacillus in the blood of sheep dead of that disease. Still, it was not till 1861, when Pasteur published his work on fermentation, that the relations existing between what are now called bacteria and disease were pointed out. Since then the science of mycology has been making rapid strides. Numerous pathologists in all countries have prosecuted the study, and though, as is perhaps natural, a great quantity of ill-judged work has been hurried into print, and many wrong observations chronicled as facts which, when disproved, have had some tendency to throw the whole subject into contempt with the general medical public, yet, on the whole, the work has gone steadily forward, and this progress we owe principally to two men,—Pasteur and Koch. Pasteur was one of the very first in the field, and labored under the disadvantage of having to invent himself all the methods he used, having but a very small and imperfect stock of the experience gained by others to go by. In spite of these obstacles he has done great and original work, and if all his statements are not marked by the accuracy that distinguishes his German collaborator, and if he is at times given to somewhat bold flights of fancy, due allowance should be made for the national peculiarities of a Frenchman. Koch improved and extended the methods which he found in use, and brought to bear on his investigations a mind too critical, and a judgment too cold, to become warped into partiality by any glittering semblances of truth. His thorough scientific honesty, his truly Darwin-like patience in waiting to thoroughly test by proof and counter-proof the accuracy of his observations, before announcing them to the world in print, his ripe judgment and clear reason, have all borne their fruits, and Koch stands to-day the foremost investigator in this field of science. To him we owe our knowledge of the life-history of the anthrax bacillus,—the work that first brought him into prominence,—and more recently that of the tubercle bacillus.

Bacteria are vegetable cells of various shape, devoid of chlorophyll, and consist of a highly refractive nitrogenous substance,

called by Nencki *mycoprotein.* As they exhibit a high degree of resistance toward the action of acids and alkalies, Cohn has supposed them provided with a covering of some hydrocarbonaceous material like cellulose.

In shape, they may be spherical (micrococci), or rod-shaped (bacilli), or spiral (spirillæ). Many of the rod-shaped varieties have a thread-like appendage at one end, called a flagellum, by means of which they are capable of motion through the liquids in which they reside. The motion so often seen in bacteria when examined in a drop of liquid, as urine, under the microscope, is not necessarily a sign of life, as this motion may be due to the Brownian movement seen whenever small particles are suspended in a liquid. They multiply in two ways, either by a bacterium dividing into two by fission (hence the name *Schizomycetes*, or *Spaltpilze* of the Germans), or by spores forming within them, which are set free by the death and subsequent disintegration of the bacterium.

Bacteria of one kind or another are distributed, as far as we know, everywhere; but some producing very marked and specific changes in the organisms in which they may happen to lodge, as anthrax, malaria, typhoid, yellow-fever germs, etc., etc., are endemic in certain localities, and are plants peculiar to those localities. To cite the best known of these, we will take the *bacillus anthracis*, which causes in animals the disease known as splenic fever; in German, *Milzbrand;* in French, *charbon.* This bacillus occurs in certain marshy districts of Europe, and to a limited extent also in this country, and causes the endemic appearance in the cattle inhabiting these parts of the splenic-fever disease. Koch has discovered that the plant grows as well outside of the body, in a suitable medium, as in it, and this explains the yearly recurrence of the disease at certain seasons of the year in the same localities without fresh infection being introduced from without. He found that the bacillus grows best in an *alkaline* vegetable infusion. Ordinarily, vegetable infusions are acid in reaction, but in these infected localities it has been found

that owing to lime in the soil they are alkaline, and hence afford the desired reaction for the best propagation of the plant.

Cattle, by grazing in these districts, become infected with the spores through abrasions on the lips, tongue, etc.; or, as Koch has also shown, the spores develop in the alkaline fluids of the intestinal canal into the perfect bacilli, which then penetrate the walls, and thus gain entrance to the circulation. Another mode of infection is by direct contagion, one animal coming in contact with the secretions from the mouth or nose, or with the blood, of another already infected. In the living body the bacilli do not go on to sporification, but multiply only by fission; but the bacilli which have been developed in the body from spores, by being eliminated by the secretions, and falling on the earth or grass of the fields in which the cattle graze, form new centres of infection, for here they go on again to the formation of spores. It is doubtful whether direct infection by means of the bacilli is often effected, since these are so easily destroyed. This is in marked contrast to the spores, which may be exposed to great variations of heat and cold, to the action of strong alcohol and other chemicals, without losing their vitality. The bacilli do not develop except at a temperature above 18° C., and in the presence of oxygen.

Pasteur attributed to earthworms the carrying to the surface of the spores developed from the bacilli buried with dead animals, but Koch has shown that at the depth at which animals are ordinarily buried, the temperature in European countries does not usually rise above 18° C., and that the bacilli soon perish. The dropping of the animal secretions containing bacilli is quite enough to account for all sources of repeated infection.

Probably the most widely diffused of all bacteria are those causing putrefaction and fermentation, for they seem to be ubiquitous. They are the great scavengers and chemists of nature, removing useless, dead material, and reconverting it into its original elements, to be used afresh for the making of new bodies, whether animal or vegetable. Different bacteria, morphologically

identical as far as we can determine with the means now at our command, may have very different chemical properties. Thus the *bacillus subtilis* found growing on hay, and the *bacillus anthracis*, are to all appearance exactly alike, yet the one is harmless, while the other is most deadly. Indeed, this very similarity, combined with errors in the experimental methods employed, induced Buchner to believe that the harmless hay bacillus could, by appropriate cultivation, be converted into the fatal anthrax bacillus, and that the two were in reality identical.

Koch, however, exposed the fallacy of this opinion by showing that Buchner's cultures were not pure ones, and that his cultivated hay bacilli had from the very first become contaminated with those of anthrax, which finally had so gained the upper hand as to crowd out the former, and consequently to produce, when inoculated, symptoms due to the latter alone.

Precisely in what way the bacteria induce in the body the changes which they do, is not known, but that they grow at the expense of the food which they consume is evident. Some have been found incapable of living without oxygen, whilst others die in the presence of it, or at least lose their characteristic properties. To the former Pasteur has given the name of *Aërobes*, while to the latter that of *Anaërobes*. That the bacteria by their growth soon exhaust the medium in which they are of its power of nourishing them, is shown by the fact that when in such a medium all further growth has come to a stand-still, by transferring a portion of its bacteria to a fresh culture-ground, their growth will go on uninterruptedly until this medium in its turn becomes exhausted.

In some cases it has been most clearly shown that the disturbances produced in a living body by the presence of organisms in it, are due not directly to their mere mechanical presence, but to the effects of some substance elaborated by them in their growth, and which acts as a poison upon it. Thus Panum induced symptoms of great depression, vomiting, purging, collapse, and finally death, with or without fever in different cases, in dogs in which he

had injected varying quantities of a carefully filtered solution of rotting nitrogenous substances. Possibly these effects were due to the ptomaïnes, those cadaveric alkaloids which, as Selmi has discovered, are produced in decomposing organic remains. Bergmann and Schmiedeberg found in putrid yeast a crystallizable substance which they called *Sepsin*. This when injected produced in dogs immediate fever and the intestinal symptoms of putrid poisoning.

In pyæmia we have a disease characterized by a septic fever, accompanied by the formation in various organs of metastatic abscesses. These abscesses are caused by the deposition in the different organs of emboli containing micrococci, which when once lodged cause a local suppuration by their growth. The micrococcus of pyæmia Koch has found to grow in colonies in the blood-vessels, and to cause thrombi in them, by surrounding the blood corpuscles, and thus rendering them more adhesive. Parts of these thrombi are torn off and are carried into the circulation as emboli, taking with them the micrococci, and causing, as we have seen, those metastatic abscesses characteristic of the disease. If the blood of a pyæmic animal, after having been carefully filtered through clay, or having its bacteria killed by boiling, be injected into another animal, a septicæmia alone will be produced, without the formation of metastatic abscesses; and, furthermore, the blood of the second animal is not infectious, showing that while pyæmia with metastatic abscesses is due to the growth of a living specific bacterium in the organs, septicæmia is caused by the poison elaborated by the bacteria being introduced into the system. This may occur from the absorption of the secretions of a wound alone, the bacteria themselves not gaining an entrance to the body. It may be due also to the presence of various kinds of bacteria, some micrococci, some bacilli, as Koch, Gaffky, Pasteur, and Sternberg have shown.

It would almost seem as though the febrile symptoms of septicæmia were due to the disintegration of the white blood globules by the septic poison, and the setting free thereby of fibrino-plastin

and fibrin-ferment, for the blood of septicæmic animals contains more free fibrin-ferment than normal, and Bergman and von Angerer, as well as others, have found that the injection into the circulation of small quantities of pepsin, trypsin, and other ferments which effect a liberation of fibrin-ferment, cause a fever exactly like that of septicæmia—observations which we have had the opportunity of confirming. Still, we are as far off as ever from the ultimate knowledge of how this fibrin-ferment should cause fever, even if it does, as the authors just mentioned affirm, produce a capillary embolism by coagulation of the blood. Besides, of the existence of this capillary embolism no really satisfactory proof to our mind is brought.

The aseptic fever of Volkmann, noticed after subcutaneous contusions, after simple fractures and the like, is considered to be due to the absorption of the products of the extravasated and disintegrating blood.

It would seem that while pyæmia is produced, as far as we now know, by but one kind of bacterium, septicæmia and suppuration may be due to various kinds.

Ogston and others have constantly found micrococci in the pus of acute abscesses, even in those in which no communication with the air could be discovered. This pus, injected under the skin of guinea-pigs and mice, caused symptoms of blood-poisoning, followed by a local abscess, in which, and in the blood of the affected animals, numerous micrococci were found. No metastatic pyæmic abscesses were found, and the animals usually recovered after the lapse of five to seven days. These micrococci, Ogston observed, were usually grouped together in clusters or in chain-form, and they preserved these arrangements when artificially cultivated. Pasteur found a micrococcus in furuncles, which, when injected under the skin of animals, caused suppuration there, though injected into the blood-vessels it proved harmless.

Some kinds of bacteria may exist in wounds without causing any suppuration, for such have been found by Cheyne, in wounds running an entirely aseptic course, and the writer has frequently

observed in the water-blisters produced on the hands by rowing or other exercises where the skin is chafed, that the fluid contained in them is full of micrococci, although no visible communication exists with the air. Here the micrococci evidently must gain entrance by perforating the epidermis. Every one of us must have had such blisters at one time or another, and yet we all know that they do not go on to suppuration.

A great deal of interest has been shown in the question as to whether putrefactive bacteria may not pre-exist in the blood and tissues of normal animals, and many experiments have been made to settle this point. The result of most of these experiments was to indicate quite strongly that these bacteria really did pre-exist, when the positive experiments of Meissner, as detailed by Rosenbach, in the *Deutsche Zeitschrift f. Chirurgie*, vol. xiii, 1880, threw them all into the shade. Meissner, by filtering the air and water in which he kept the various tissues taken from living animals, was able to preserve the latter entirely undecomposed, and without the aid of any disinfecting chemicals whatever, for an indefinite length of time—up to two years. Such positive experiments are worth any number of negative ones.

It is a universal experience that one attack of an infectious disease, as measles, scarlet-fever, small-pox, etc., gives immunity to subsequent attacks. The reason for this is not clear. The opinion has been advanced, that the bacteria, to which the infectious diseases are due, by their growth in the body remove from it that certain something which forms a suitable soil for their propagation, and that this is not reproduced. In view of the fact that the constituents of the body are so constantly undergoing changes, the old being replaced by the new, this idea seems hardly tenable ; still, as yet no better hypothesis has been offered.

The preventability of infectious diseases is a subject that, from the very beginning of our knowledge of disease germs, has occupied the attention of investigators, and has, in their hands, met with a great deal of success. The methods employed are two. The first seeks to exclude the germs entirely from entering the

system and gaining a foothold there: The second endeavors, by the inoculation of a "mitigated virus," to produce a mild form of what would otherwise be a severe, perhaps fatal, disease; this mild form, however, having the same effect as the severe one, of giving immunity—for some time at least—to subsequent invasions of the germ. In the first category are embraced all quarantine and hygienic regulations generally, as applied to communities; and, to individuals, the Listerian treatment of wounds. In Listerisim—and by that term we do not mean merely an observance of the details of gauze, carbolic acid, macintosh, rubber protective, spray, etc., etc., that go to make up a "Lister dressing," but the application of disinfection to wounds in its widest sense, whether with chemicals or without,—in Listerism, we say, we have a recognition of the fact that the unhealthy suppuration of wounds, and its bad after-effects upon the body, are due to the presence of bacteria in the exposed parts, and the absorption from the latter either of the germs themselves into the body, or the products of their growth, which act as a poison on the tissues. Inoculation of small-pox has been practised in China from the very earliest ages, but it was not till 1717 that Lady Mary Wortley Montagu introduced it into England, where, after much opposition, it became popularized, only to be superseded by vaccination, first employed by Jenner in 1796. The method pursued in inoculation was to take the virus from the pustule of a small-pox patient after the eighth day, and to introduce this beneath the skin of the person to be inoculated. The disease which followed resembled ordinary small-pox, excepting that it was much milder in degree; like it, too, it was characterized by a general eruption. Jenner, already in 1770, communicated to John Hunter his observation, that persons infected with cow-pox from milking affected animals, remained exempt from small-pox, but it was not till 1796 that he actually practised vaccination on a child. The subsequent progress of vaccination is too well known to need further comment.

In the past few years, Pasteur, Toussaint, Chauveau, and others, chiefly of the French school, have given much attention to the

prevention of anthrax, chicken cholera, and some other infectious diseases affecting animals. Their idea has been to render by various ways the bacteria less active in their manifestations than before, while yet retaining enough vigor to grant immunity against attacks of the unchanged plant. Pasteur's mode of "attenuating" the anthrax bacillus is to keep it permanently at a temperature of 42°–43° C. in neutralized chicken-broth. Its vitality is thus gradually lowered, till at about the end of a month it dies. By using the cultivations at different times within this period different degrees of intensity may be reached. Pasteur claims that the bacillus undergoes an actual physiological modification, but whether it does so or not is still a disputed point with mycologists. Some assert that its effects are due simply to dilution, for the same effects have been produced by using for inoculation a highly diluted virus. When we remember that in the body the anthracis bacilli do not go on to the formation of spores, and multiply only by fission, and this to a not unlimited extent, it seems plausible enough to suppose that a few bacilli would produce symptoms less severe than if many were introduced into the system. On the other hand, the decrease in the virulence of epidemics toward their close, indeed, the fact that they cease at all even when there are plenty of unaffected individuals about, would seem to be a point in favor of a physiological change,—a certain decrepitude, so to speak,—gradually overtaking the later generations of the germs. Again, in vaccine and in small-pox, we seem to have another evidence pointing strongly to modification by soil. Cowpox inoculated on man gives immunity against variola. The contents of a true variolous pustule from a human being, on the other hand, inoculated on a heifer, produce cow-pox, which, however, in turn produces the latter disease again in man.

While the cause, therefore, is yet to be settled, the fact nevertheless remains that the inoculation of cattle has been successfully practised on a large scale in France, Germany, Hungary, Holland, the Cape of Good Hope, etc., both for anthrax, pleuropneumonia, and tagsore (variola of sheep). It does not, however,

give perfect immunity in all cases, especially from infection by way of the alimentary canal. Extensive experiments are being carried on at the present time which will, no doubt, throw more light on this question, so highly important from an economic point of view.

In the past year and a half the most important discovery announced in mycology is that of the *bacillus tuberculosis* by Koch, who in a comprehensive series of experiments that have since been widely repeated, demonstrated that the disease tuberculosis is due to the invasion of the body and the growth in it of a bacillus. Koch's discovery was the last link in the chain needed for the absolute proof of the bacterial origin of tubercle, for the experiments of many observers, notably Cohnheim, had shown that it was a truly infectious disease, due most undoubtedly to an organized inoculable virus.

The presence of bacteria of one form or another has been demonstrated in a number of diseases besides those already mentioned, as erysipelas, gonorrhœa, syphilis, lepra, malaria, typhoid and recurrent fevers, measles, etc., etc., but only in a few of them has the absolute dependence of the disease on the presence of the bacterium been demonstrated. Many difficulties lie in the way of affording this proof, chief of which are the inability to cultivate the germs outside of the body, and the insusceptibility of animals in whom they are inoculated. Thus gonorrhœal micrococci, cultivated in sterilized media through several generations, while producing a most unmistakable clap when introduced into human urethræ, prove harmless to animals.

When we review all the facts relating to the germ theory of disease, a brief outline of which we have attempted here, it seems to us that the odds are overwhelmingly in its favor; that by it conditions are explained for which there is no other satisfactory solution; and that it casts a clear light on questions which have baffled all previous investigation. It will, of course, like the theory of evolution, be combated for a number of years to come, especially by the strongly conservative members of the profession, who find it hard to throw off the traditions of years, but Time, which healeth all things, will cure this disposition too.

WALTER MENDELSON.

NEW BOOKS AND INSTRUMENTS.

Bacteria and the Germ Theory of Disease. Eight lectures delivered at the Chicago Medical College by Dr. H. GRADLE, Prof. of Physiology, Chicago Medical College, Oculist to the Michael Reese Hospital. 8vo, pp. 219. Chicago: W. T. Keener, 1883.

On the Relations of Micro-organisms to Disease. The Cartwright Lectures delivered before the Alumni Association of the College of Physicians and Surgeons, New York, February 19, 21, 24, and 27, 1883, by WILLIAM T. BELFIELD, M.D., Lecturer on Pathology, and on Genito-Urinary Diseases (Post-Graduate Course), Rush Medical College, Chicago. Reprinted from *The Medical Record*, February and March, 1883. 12mo, pp. 131. Chicago: W. T. Keener, 1883.

We have elsewhere[1] given a review of the contents of both these excellent little books, which we can cheerfully recommend to those who wish to obtain a good insight of the bacterial question as it stands at the present time. Of the two, that of Dr. Gradle is perhaps to be preferred, as it is fuller, and more systematically arranged than the other, and contains numerous references in foot-notes. It is a pity that Dr. Belfield's lectures, when prepared for the press, to be published in book-form, were not subjected to a more thorough revision, especially in the matter of giving references, etc. On the other hand they are furnished with numerous engravings of photo-micrographs from the originals of Koch, which are highly instructive and interesting.

One thing we cannot too strongly deprecate in this work, and that is the tendency to hold up to ridicule and scorn any one who does not happen to agree with the opinions of the author. A just criticism and searching analysis, when honestly meant and fairly

[1] See Editorial on "The Germ Theory of Disease," on page 176 in this number of the ARCHIVES.

conducted, even though they should be wrong in effect, are proper and legitimate, and further science by provoking discussion and ultimate correction. But a sneering tone, and ridicule, and irony, when criticising another's work, is as unwise as it is unjust, for none but the shallowest mind could be warped in its consideration of a scientific research by the fun poked at it by an adversary, and one should have very good proofs before intimating that another seeks wilfully to repress facts. Nor need a man be necessarily an ignoramus because he does not know all that has gone before in his line of study. Ridicule is no argument, and irony no proof.

Photo-Micrographs and How to Make Them. Illustrated by Forty-seven Photographs of Microscopic Objects, Photo-Micrographs, Reproduced by the Heliotype Process, by George M. Sternberg, M.D., F.R.M.S., Major and Surgeon U. S. Army, Member of the Biological Society of Washington, Honorary Member of the Microscopical Societies of Baltimore and of San Francisco, Fellow of the American Association for the Advancement of Science, etc., etc. 8vo, pp. 204. Boston: James R. Osgood & Co., 1883.

Within the last year or two amateur photography has come greatly into vogue, and while for many it is a mere pastime intended only for amusement and the reproduction of favorite scenery or other objects, for the professional man it has become of really great and permanent use in his work. Physicians are largely employing it for recording the appearances of interesting cases. Photographs taken of the same patient from time to time serve as a means of comparison between different states, and thus new elements of accuracy are introduced.

With the improved and convenient apparatus now manufactured by numerous reliable dealers, any physician can, at a moderate outlay of cost, become his own photographer, and thereby add greatly to the interest and value of many of his clinical histories.

In the work under consideration Dr. Sternberg, whose contributions to mycology are well known, has sought to popularize the photographing of microscopic objects, and has given us a book in which various methods are described, and the difficulties liable to be met with pointed out. The book, as the author states in the preface, is intended for beginners and not for such as are anxious to attempt the more difficult feats of photo-micrography. It is divided into two parts, in the first of which the technology of

photo-micrography is treated of, while the second is devoted to a description of the series of heliotype plates with which the work is furnished. Under the heading of technology is embraced a very complete consideration of the subjects of light, microscopical and photographic apparatus with their arrangement, the fitting up of an operating-room, or, when this is not procurable, of an arrangement for use in an ordinary room ; the projection, focussing, and measuring the object upon the screen ; the development of the negatives, with formulas and directions for manipulating the different chemicals used, and the methods of making positives on glass. This is followed by a consideration of the objects most suitable for photographic reproduction, and the best methods for preparing and mounting them to that end.

The second part of the work is taken up with a description of the forty-seven heliotypes, illustrating various animal and vegetable tissues, and the lower forms of plant and animal life.

There is so much useful information in the book that we can only regret that it was not made a little fuller by more detailed explanations of the uses of various kinds of apparatus used. The author is evidently accustomed to work with one of the rather complicated forms of English instruments, provided with numerous "accessories" of all sorts,—accessories which any one brought up in the German school of microscopy (and we venture to say that this is the most popular in this country) knows hardly any thing about. By a little more labor in preparing the text, and by the help of a few outline drawings of apparatus, we are sure the work would gain greatly in value. Nor should an account of the process of making silver prints have been omitted.

Many of the heliotypes are highly instructive, but in the explanatory text there are several errors of reference which are rather disturbing. Thus, on page 38, plate xi is referred to when plate xv is really meant. On page 103, fig. 2 of plate iii is spoken of and described as the epithelial cell from the mouth of the frog, while on page 101 it is correctly given as the *Euglena viridis*, and we have nowhere been able to find any representation of the epithelial cell referred to. On page 107, reference is made to plate i, fig. 2, as an example of the use of the photographic method in cases in which parasitic organisms are present in the blood, whereas the plate referred to forms the frontispiece of the book, representing the arrangement of the various apparatus for photographing. Plate ii, fig. 2, is probably what is meant. These

are the errors which we have happened to come across without especially searching for them. They are annoyances which a more careful proof-reading would do away with.

In looking over the series of plates we are impressed with the fact that photo-micrographs will be most useful to those already quite familiar with the appearance of the objects represented, and we do not think they are as yet calculated to supersede a carefully and intelligently made drawing prepared by the microscopist himself. Too often the drawings for our text-books are made by draughtsmen, skilful enough with the pencil, but knowing nothing of the nature of what they are drawing. So errors slip in which a microscopist would not make. A beginner, we are sure, will be helped more by a well-made drawing than by a photograph, while the latter will be of more satisfaction to the well-versed microscopist. The two must supplement each other.

Of the plates, plates v and vi, representing different specimens of blood, strike us as being particularly good, the shape of the disks being very distinct, and all the details sharp and clear, though the magnifying power is as high as 1450 diameters.

The book is excellently printed on exceptionally heavy paper, and plainly but substantially bound. [W. M.]

ORIGINAL OBSERVATIONS.

CASE OF GENERAL NEURALGIA.*

By J. T. ESKRIDGE, M.D.,

PHYSICIAN TO ST. MARY'S AND JEFFERSON MEDICAL COLLEGE HOSPITALS, PHILADELPHIA.

Gotlieb B., German, æt. twenty-nine, married, laborer in an iron-foundry, denies ever having had any venereal disease. No cicatrices are found on his penis, and his three children are well developed and healthy in appearance. His father, who suffered from some supposed inflammatory spinal trouble, is dead. His mother, still living, complains of great pain in the abdomen. His hair is not well preserved, the top of his head being nearly bald, and the sides rather sparsely covered with dark curly hair. His skin is thin and of a reddish hue. He is short, rather stout, and has a nervous, irritable appearance. He enjoyed good health until the year 1873, when he suffered from an attack of left-sided pneumonia, which confined him to his bed four weeks.

Two years ago, after sleeping one night in a damp bed, he noticed a dull, heavy pain in the dorsal and lumbar regions of the spine. After the spinal trouble had continued about one month, or until May, 1881, it became complicated during the next month by a very painful condition of the left sciatic nerve. During these two months, although he was scarcely able to stand erect, and locomotion was very painful and exceedingly difficult, he managed daily to hobble to and from his work, a distance of several squares, and was compelled to stand on his feet about ten hours each day. The following summer he was able to walk quite well, although a little pain was experienced when the left sciatic nerve was firmly pressed upon. In October, 1881, melted hot iron fell in his left shoe and burned his ankle severely. The scar is rather superficial, and extends from an inch behind the internal malleolus over the instep to a point about the same distance behind the external malleolus. The burn was most superficial, but its area greatest

* A paper read before the American Neurological Association, June 20, 1883.

around the internal malleolus; on the outer aspect of the ankle the area was small, but the wound extended to the bone. The scar over the instep is about three fourths of an inch in width. From the effects of the burn he remained in the University of Pennsylvania Hospital eleven weeks. After leaving the hospital comparatively free from suffering, he returned to work, but one week later he began to experience great pain in the left leg and ankle. This attack lasted about one month, and the pain was greatly relieved by pressure over the sciatic nerve as it emerges from the pelvis. During the next ten months he suffered more or less, but was able to work. In October, 1882, he was admitted into the nervous wards of the University Hospital, and remained there five weeks, suffering from severe pain—which extended from the lumbar region down the posterior portion of the thigh and leg to the left foot. At that time the pain was most intense in the ankle. He improved slightly while in the hospital, but soon after returning to work his condition became worse than it had been at any previous time.

He was admitted into the medical wards of the St. Mary's Hospital, January 15, 1883. On admission he was scarcely able to walk, complained of great pain in leg and back; sleep was broken, appetite capricious, and bowels constipated; temp. 100°; pulse 92; resp. 24. The spine was very tender on pressure in the dorsal and lumbar regions. All the superficial nerves of the left leg, thigh, and gluteal region were the seats of neuralgic pain, and light pressure over any portion of the affected nerves greatly augmented his sufferings. The scar around the ankle was probably a little more sensitive than other portions of the neuralgic area. Absolute rest in bed was enjoined, counter-irritation was made from time to time over the spine and left sciatic nerve, and most agents of repute in the treatment of neuralgia and rheumatism were tried in various combinations, but nothing, except hypodermic injections of morphia and atropia, seemed to afford much relief, and the effect of these medicines were decreasing, and never more than temporary. Chloroform injections appeared to increase rather than lessen his suffering. Early in February, the internal saphenous and genito-crural nerves of the left side became the seats of severe neuralgic pain. The left side of the scrotum was red, burned like fire, and was so tender that he complained bitterly when the part was touched. The scrotum on the right side of the median line was normal in appearance and entirely painless. The disease had extended up the spinal

cord and involved the brachial plexuses, first of the right side, then of the left. Double dorso-intercostal neuralgia soon became well established, and nearly constant. Left dorso-lumbar neuralgia was complained of, but not to as great an extent as the dorso-intercostal. Of the five foci mentioned by Anstie as characteristic of true neuralgia of tbe superficial branches of the lumbo-abdominal nerves, the vertebral, abdominal, and scrotal points were well marked on the left side ; the other two, though present, were so slight as to be easily overlooked. Extension was made upon the leg by means of pulley and weights, for an hour every night and morning, but relief, although almost complete at first, gradually grew less and less, until after the lapse of two or three days, when each time the apparatus was applied, it invariably increased his sufferings after it had been on a few minutes. The increased pain was thought to be due to the adhesive plaster irritating the sensitive cutaneous surface of the leg. During the latter part of February, after etherizing the patient, the sciatic nerve was stretched by forcibly flexing the thigh upon the body, the leg being at the same time extended. After the effects of the ether had passed off, hypodermic injections of morphia had to be resorted to to relieve pain which had greatly increased after the operation. The next few days the patient's suffering greatly increased, the pain in the leg and lumbar region having become constant and very intense. Repeated injections of full doses of morphia several times during the twenty-four hours were found necessary to make life tolerable. By the early part of March he had become exceedingly nervous and somewhat hysterical, every thing seeming to irritate him. His appetite was poor, he was losing flesh, and his bowels alternated between diarrhœa and constipation. At that stage of the disease he frequently complained of palpitation of the heart, and pain in the præcordial region.

As cod-liver oil, iron, strychnia, arsenic, quinia, and various other remedies had been used without securing much relief to the patient, and as the hospital possessed neither a galvanic nor faradic battery in working condition, it was determined to suspend all other remedial efforts, and resort alternately to cold and hot applications to the spine and painful sciatic nerve. Bladders filled with ice, and rubber bags with hot water, were alternately applied every five minutes, for an hour each day. During the first week of this plan of treatment, when it was faithfully carried out and personally superintended by the resident physician, Dr.

Moylan, the pains greatly lessened, no morphia being required, and the patient's appetite and general condition improved. Subsequently the treatment by cold and hot applications had to be trusted to the male attendants. It was not long, however, before the wards of the hospital bcame so crowded that the attendants found it impossible to give proper attention to this rather troublesome plan of treatment, and in consequence, sometimes the ice, as well as the hot applications, was allowed to remain in contact with portions of the body from fifteen minutes to half an hour. As might be expected, he was chilled by the ice. His neuralgic pains returned, and began to be felt in nerves that before had been free from pain. About that time the three divisions of the right fifth cranial nerve were attacked, and soon became very sensitive and acutely painful, although the nerves on the left side of the face were free from pain, and have remained so up to the present time. As soon as it was found to be impossible to have the hot and cold applications changed as frequently as was necessary, this plan of treatment was abandoned. It may be stated that the object of this treatment was to modify the nutrition of the parts by rapidly changing the state of the circulation.

By the middle of April, the man could walk slowly about the wards of the hospital. At that time he was not suffering much pain, except for a day or two prior to decided changes from high to low barometic pressure. Most of the larger superficial sensitive nerves were painful on pressure, the left fifth cranial nerve alone having escaped. On April 12th, he first experienced slight pain in the right sciatic nerve. This nerve became painful soon after a mild faradic current had been applied for the purpose of testing the electro-muscular contractility. On a few occasions since, he has had slight pain in the right knee, but the right sciatic nerve does not now (June 6th) seem to be generally involved. The sensibility of the skin involved by the burn was increased on the outer side of the foot, but other portions of the cicatrix were not more sensitive than the general cutaneous surface of that leg.

Electro-muscular contractility was well preserved, and about equal on both sides of the body.

Electro-sensibility was increased in the left leg and in both arms. Condition of special senses :

Taste :	right	side	normal ;	left	side	impaired, especially for sugar.
Smell :	“	“	“	“	“	not so acute.
Hearing :	“	“	good ;	“	“	good, and equal to the right.
Sight :	“	“	$\frac{20}{20}$;	“	“	$\frac{20}{20}$ (?)

May 27th.—During the last five weeks he had been treated exclusively once or twice weekly by means of electricity. The faradic current had been used most of the time, but on a few occasions the galvanic had been employed. For more than two months, with a few exceptions, the man's general condition had been gradually improving, the pains had lessened in severity and frequency, he had gained several pounds in weight, was then able to walk a mile or more without resting, and did not find much difficulty in doing light work. The girth of various portions of the arms and legs had been measured from time to time, but no wasting of groups of muscles had been observed at any time.

May 31st.—After carrying a large basket filled with marketing on his back, a distance of several hundred yards, a few days before, rather sharp pains were experienced in the lower lumbar region of the spinal column, and in the upper portion of the left sciatic nerve. Several points of tenderness were observed over superficial nerves, around the left knee, in the left groin, in the arms, and over branches of the right fifth cranial nerve. At that time pain was severe and constant in the left popliteal region, but it could be almost entirely relieved for the time by a strong faradic current continued for several minutes.

June 4th.—My friend, Dr. C. K. Mills, kindly examined the patient with me. It was noted that electro-sensibility was greater in the right leg than in the left. In the right leg the current passing through the electric brush was felt with a half inch of secondary coil, and in the left it was not observed until one inch of the secondary coil was used.

Good faradic contractility was found in the muscles of both legs.

On using the galvanic current, no reactions of degeneration were detected.

The patellar, cremaster, and iritic reflexes when investigated were always found to be normal.

CUTANEOUS SENSIBILITY AS TESTED BY THE ÆSTHESIOMETER.

	April 11, 1883.		May 22, 1883.	
Tip of great toe . .	R. 12 mm. ;	L. 17 mm.	R. 10 mm. ;	L. 13 mm.
Dorsum of foot . .	R. 41	L. 48	R. 40	L. 60
Skin over anterior surface of tibia .	R. 35	L. 57	R. 55	L. 48
Popliteal space . .	R. 38	L. 70	R. 35	L. 40
Inner side of knee .	R. 23	L. 37	R. 25	L. 22

Outer side of knee	R. 32 mm.;	L. 32	R. 31 mm.;	L. 29
Anterior thigh	R. 50	L. 59	R. 60	L. 55
Groin	R. 39	L. 54	R. 58	L. 58
Scrotum	R. 45	L. 64	R. 45	L. 60
Outer side of thigh	R. 52	L. 55	R. 50	L. 45
Post. side of thigh	R. 56	L. 74	R. 70	L. 70
Inner side of thigh	R. 45	L. 48	R. 46	L. 60
Upper gluteal region			R. 14	L. 32
Lower gluteal region	R. 45	L. 58	R. 39	L. 36
Lumbar region	R. 64	L. 90	R. 52	L. 48
Dorsal region	R. 82	L. 89	R. 57	L. 64
Post. cervical region	R. 52	L. 52	R. 57	L. 52
Lateral cervical "	R. 48	L. 55	R. 55	L. 45
Abdominal "	R. 32	L. 38	R. 25	L. 30
Lateral costal "	R. 52	L. 55	R. 35	L. 28
Anterior " "	R. 52	L. 44	R. 38	L. 44
Tips of fingers	R. 10	L. 15	R. 10	L. 14
Palm of hand	R. 32	L. 25	R. 25	L. 18
Dorsum of hand	R. 29	L. 35	R. 32	L. 32
Anterior surface of forearm	R. 35	L. 35	R. 32	L. 45
Posterior surface of forearm	R. 54	L. 48	R. 32	L. 29
Inner side of elbow	R. 52	L. 38	R. 29	L. 32
Outer side of elbow	R. 45	L. 43	R. 52	L. 38
Anterior brachial region	R. 54	L. 52	R. 61	L. 38
Skin surface of lower lip	R. 35	L. 32	R. 29	L. 25
Cheek and side of nose	R. 32	L. 22	R. 29	L. 32
Forehead	R. 35	L. 32	R. 38	L. 32

SURFACE TEMPERATURE OF VARIOUS PORTIONS OF THE BODY COMPARED.

	April 11, 1883.	May 31, 1883.
Axilla	R. 99.1°; L. 99.1°	R. 98.6°; L. 98.6°
Calf of leg	R. 93.2°; L. 92.4°	R. 94.8°; L. 94.6°
Inner thigh	R. 97.6°; L. 96.5°	R. 97.4°; L. 97.3°
Upper posterior thigh	R. 97.4°; L. 96.5°	R. 97.6°; L. 98.3°
Lumbar region	R. 97.2°; L. 96°	R. 96° ; L. 96.8°
Cheek	R. 96° ; L. 97.2°	
Posterior frontal region of head	R. 96.9°; L. 97.4°	R. 96.6°; L. 96.8°
Over cerv. vertebræ	94.6°	
Over upper dorsal vertebræ	96.4°	
Over lower dorsal vertebræ	96.3°	

Over lumbar vertebræ	96.1°	
Parietal station of head		R. 96.9°; L. 96.6°

June 6, 1883, special senses remain about the same as found April 11th.

Tactile sensibility.—On April 11th, thirty-two comparative æsthesiometric observations were made. Fifteen corresponding bilateral stations were selected on the lower limbs, extending from the great toe to the lumbar region. In fourteen of these stations, the two points of the æsthesiometer were recognized when they were from three to thirty-two millimetres nearer to each other on the right or healthy side than on the affected side, the average of the differences having been a little more than thirteen millimetres.

Over the three main branches of distribution of each fifth cranial nerve, three corresponding bilateral stations were selected for comparison,—one station on the cutaneous surface of the lower lip, one on the cheek and side of nose, and one on the forehead. The two points of the æsthesiometer were recognized when they were from three to ten millimetres nearer to each other over the left or healthy nerve than over the affected nerve, the average of the differences having been about five millimetres.

On the outer side of each knee the two points of the æsthesiometer were recognized at equal distances.

The other fourteen comparative observations, noted on that day, were made at corresponding bilateral stations over various portions of the trunk and upper extremities, parts of the body affected by bilateral neuralgic pains. Over these parts the sense of touch was better on the right side at six stations, on the left at six, and equal on both sides at two. The averages for the two sides were equal.

The sense of pain was more pronounced in the neuralgic areas, or where the sense of touch was diminished.

On May 31st, about fifty days after I had made the æsthesiometric observations which I have given in detail, during which time the patient had improved as stated in a former portion of this paper, I repeated my observations on his sense of touch, selecting, with one exception, the same bilateral corresponding stations employed April 11th. Of the latter series of thirty-two observations, the sense of touch was better on the right side thirteen times, on the left sixteen, and equal on both sides three times.

At that time it was observed that wherever comparative tactile sensibility was diminished, the sense of pain was lessened. This relation of pain and tactile sensibility was just the reverse of what had existed nearly two months before. No anæsthetic zones or areas were detected at any time.

Surface temperature.—On April 11th, when the temperature in each axilla was 99.1°, six comparative bilateral surface-temperature observations were made. The temperatures, without a single exception, were a little lower in the neuralgic than in the corresponding portions of the opposite or healthy side of the body, the difference having varied from a fraction of one degree to one and a half degrees. Over the lumbar and dorsal regions of the cord the temperatures were about two degrees higher than over the cervical region. The greater portion of this discrepancy of the temperatures over various parts of the cord may be accounted for, I think, by the cervical region having been exposed, while the lumbar and dorsal were well protected by covering. The man was in bed when the observations were made.

On May 31st, the comparative bilateral surface-temperature observations were repeated, and the temperatures found to be nearly the same on both sides of the body.

The diagnosis of the case that I have described in this paper was exceedingly difficult during some stages of the disease. At one time I thought that the chief symptoms pointed very strongly to spinal congestion or inflammation, followed by diffuse descending neuritis. Later, when the patient was improving, I was inclined to regard the disease as one of general neuralgia. About the middle of last April, I gave a short account, which has not been published, of the case, calling it general neuralgia, before a clinical meeting of the Philadelphia County Medical Society. The neurologists present at the meeting were divided in opinion: some thought the affection was general neuralgia; others were inclined to view it as one of polio-myelitis followed by diffuse descending neuritis.

The trouble having commenced in the lumbar region of the cord after the man had slept one night in a damp bed; its spreading to the sciatic nerves; the extension of pain up, and involving the greater portion of, the spinal cord and all the nerves of the brachial plexuses, when taken in connection with patient's deplorable condition at one time, and with the fact that the part first attacked—the lumbar portion of the cord—was, until a few weeks ago, the seat of great and constant pain, and very sensitive to

pressure and the passage of a mild faradic current, suggest the inquiry : Has not the case been one of general neuritis following inflammatory spinal trouble, and improved ?

In favor of general neuralgia it may be stated :

1. That we have a disease that has extended over a period of more than two years, made up of attacks of pain lasting from two to six months, in a man whose condition and general appearance to-day seem to be as good as they were after the first attack in the year 1881.

2. That several times, by firm pressure over the great sciatic nerve as it emerges from the pelvis, he had succeeded in relieving pain in the foot and leg.

3. That in inflammatory conditions of the cord of so long duration reactions of degeneration and other atrophic disorders would probably be found, and improvement, if it should occur, would be slower and less complete than it has been in the present case.

4. That the left leg and right fifth cranial nerve were severely affected, while the left side of the face entirely, and the right leg almost entirely, escaped.

5. That pain was often shooting or stabbing in character, differing from the dull ache of neuritis.

Could not the case have had a syphilitic origin, and the inflammatory exudation have disappeared, leaving the man in his present condition ? Against this view certain facts militate. When the patient first came under my care, he was promptly put upon anti-syphilitic treatment ; and, notwithstanding the treatment was continued for a number of weeks, he grew worse instead of better. He did not begin to improve until after this plan of treatment had been abandoned more than a month. No anæsthetic zones or areas, such as have been pointed out as occurring in cases of syphilitic neuritis, were observed at any time.

(After the paper was written for the Association, pustular eruptions developed along the course of the superficial nerves of the arms and upper portions of the chest. Also a severe neuralgic condition of the coccyx had supervened.)

July 14, 1883.—The man's general condition remained about the same as it was in the early part of June. Some days he was entirely relieved of pain, but at other times he suffered considerably. Galvanic and faradic currents were discontinued in his treatment, and static electricity was solely employed, from twenty to thirty minutes, almost daily for two weeks. After the second

séance he was free from pain and remained so during the remainder of July, when he left the hospital to engage in work in an iron-foundry.

Aug. 27th.—During the last three weeks he has been able to work daily in the foundry. He occasionally suffers from twinges, especially just before sudden changes in barometric pressure, but still he is so comfortable that he considers himself quite well.

ARCHIVES OF MEDICINE.

Original Articles.

ON THE RELATIVE IMPORTANCE OF ELEVATION, DRYNESS, AND EQUABILITY OF TEMPERATURE IN THE CLIMATIC TREATMENT OF PULMONARY CONSUMPTION.

BY J. HILGARD TYNDALE, M.D.,
NEW YORK.

SAID Laennec: "Of all the means hitherto recommended for the cure of phthisis, none have been followed more frequently by complete cessation of the disease than change of climate." The value of a change of climate from the one where the patient resided to one of different attributes, has been more or less recognized since the days of Hippocrates. Such changes were made arbitrarily from continental to marine climates, or from cold to warm, by changing latitude; always governed by the sensations of the patient. If from time to time climato-therapy has completely fallen into disrepute, it is solely owing to the bad results attained, and these again are entirely due to the wrong method of choosing, according to the inclinations and sensations of a patient.

For the last two decades meteorological observations and climatic treatment of consumption have taken a new lease of life. Without going into detail, let me briefly state the facts. Hygrometrical, barometrical, and thermometrical observations now carried on in every civilized country of

the earth, have established that the three prime constituents of climate are: dryness, elevation, and equability, which constituents of climate were up to that time subordinated to the mean degrees of temperature of the air—warmth and cold. A vast majority of physicians prescribed *uniform warmth;* and though this means warmth with equability throughout the year, it was the warmth which was chosen as the therapeutic agent to suit the patient's sensitiveness of skin and respiratory mucous membranes. To uniform warmth, equability was subsequently added as a requisite, (a small range of temperature throughout a season,) and the leading idea of this school was, and is to-day, to give the patient the benefit of almost continuous out-of-door life; the benefits claimed being, as I have said, *equable warmth* with *abundance* of sunshine.

Stress is here laid upon "abundance," as it is desirable to remember for what follows, that abundance and intensity are two different features.

Warmth as the prime factor was the sequel of Broussais' teaching of laying greatest stress upon the inflammatory nature of consumption.

Such a climate is found upon islands in mid-ocean and on the sea-coast in the torrid zone, and the southern latitudes of the temperate zone (Madeira, Bahama Islands, Sandwich Islands, coast of Florida, Malaga in Spain, etc.), and to them patients were directed with subsequent bad or indifferent results.

In 1871 James Henry Bennett [1] strongly advocated tonic, stimulating climates, as against the above sedative ones, based upon reasoning and some favorable results. By "stimulating" Bennett means tolerably uniform coolness, an absence of excessive moisture and a fair modicum of

[1] "On the Treatment of Pulmonary Consumption by Hygiene, Climate, and Medicine," by James Henry Bennett, M.D.

sunshine; in other words, coolness and moderate dryness.

It is since the return to England of the late Dr. Archibald Smith from the Peruvian Andes that attention has been drawn to *elevation* (high altitude) as a healing factor. This was supported by the experiences and writings of Jourdanet, the experiences of Brehmer in Goerbersdorf at his sanitarium, Fuchs, Kuechemeister, Herman Weber, and Lombard.[1]

In part the benefits attained were credited to reduced pressure of the air-column at high altitude alone; in part the decrease of humidity (relative dryness) with increasing elevation was noted. Coupled to elevation and dryness were found to exist abundance and intensity of sunlight, and cool or cold temperature. These constituents of climate are at the present time engaging the attention of pneumonologists in England, Germany, and France. Drs. Williams, Weber, Yeo, of London, and Brehmer, Dettweiler, Kuechemeister, Schreiber, and others, in Germany, have noted and published results.[2] How we stand in this coüntry will be see later on.

What, now, is climate? Climate is the embodiment of some fixed elements of soil, relating to composition and physicai aspect, and of the atmosphere; the interchanges among the constituents of which are termed meteorological conditions, and form an ever-shifting panorama in the sea of air surrounding our globe.

The chief constituents of climate are:

1. Barometric pressure—the pressure of the air-column at sea-level or elevations.

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[1] Lombard, "Les Climates de Montagnes"; Archibald Smith, *Edinburgh Medical and Surgical Journal*, 1840; "Le Mexique et l' Amerique Tropicale, Climate, Hygiène, et Maladies," D. Jourdanet; Herman Weber, *Medico-Chirug. Transactions*, vols. 3 and 52.

[2] "Health Resorts," by Burney Yeo, M.D., 1882; Brehmer: "Die chronische Lungenschwindsucht," 1879; Dettweiler: "Behandlungder Lungenschwindsucht," 1882; "Davos Platz," by Alfred Wise M.D., 1881.

2. Temperature—the monthly and annual averages of degrees of heat, and the diurnal, monthly, and annual range, by which the fluctuations of temperature are noted; permitting us to judge of its *equability*.

3. Humidity—the relative quantity of vapor in the atmosphere as compared to the standard of saturation, which is called 100%. Absolute humidity, by which we learn of the *real* quantity of vapor in a given space, is in reality of greater interest and importance.

These three constituents—the weight of the air-column, differing at various elevations; equability of the temperature, according to greater or lesser number of degrees covered by the mercurial column in a given time; and the relative dryness of any region, different degrees of moisture-saturation of the air—are the main elements, and their fluctuations within certain limits of time and intensity are the features of the various climates. The degrees of temperature (hot, warm, cool, and cold), aside from their fluctuation, are only to be named as an appendix to one or more of the other factors, to express the sensation experienced by the human organism: a fact which I am trying hard to have recognized.

The other constituents partly resulting and dependent upon them are:

1. Intensity and abundance of sunlight—intensity dependent upon the purity and rarity of the atmosphere—its diathermancy, or capacity for transmitting rays. The number of clear days in a month or year bear evidence as to the abundance of sunshine. Abundance, therefore, denotes the *quantity* of sunlight, and is found in company with both equable and dry climates. Intensity denotes the *quality* of sunlight, and is associated with dryness, more particularly at altitudes.

2. Winds—the frequency, velocity of movements of the

atmosphere, and the points of the compass from which they blow.

3. Electricity—electric changes and tension.

4. Precipitation—the amount of rain, hail, and snow falling upon the earth. Measured by inches and hundredths.

5. The production of ozone.

Since these constituents are dependent upon barometric pressure, the degree of humidity and temperature, it is clear that all meteorological changes are dependent upon the relation, for the time being, to each other of these representatives of *elevation* (with corresponding decrease of barometric pressure) : *dryness* and *equability* of temperature.

Interchanges between the moisture, the temperature, and the pressure of the air-column within certain limits is that condition of climate under which the human organism commonly remains undisturbed. What are these normal limits? These can only be defined by saying that they exclude excessive fluctuation of either constituent. Excesses of moisture, fluctuation of temperature, and the effect these have on the weight of the air-column ; either one or all may occur suddenly or persistently, as so many degrees of *intensity* and *duration.*

In other words: intensity (acuteness) and persistency (duration) decide the effect of every occurrence—whether pathological, meteorological, or otherwise. Now either the suddenness or duration, or both, of excessive moisture considerable fluctuation of temperature, and the resulting change of atmospheric pressure (resulting frequently in harsh winds) may disturb the normal equilibrium of our atmospheric conditions, and with it the normal equilibrium of the vascular and nervous systems of the human organism.

Fluctuation of temperature? Do we mean a falling or a rising thermometer, sudden cold or heat? Either. Excessive moisture with sudden cold is, as we know, the fruitful

immediate cause of acute inflammation of the air-passages. Excessive moisture with sudden heat is the immediate cause of stagnant hyperæmia, venous congestions—the products of which undergo cheesy degeneration. So that we have on the one hand active *inflammation* induced ; on the other caseation—necrotic tissue and the subsequent *infection.* Let us now condense a few facts :

1. Moisture is the normal ingredient of the atmosphere. Whether the excess be one of great suddenness or persistency we know it hinders evaporation of aqueous vapor from the lungs, and retards insensible perspiration (or respiration) through the skin ; in other words, hindering equable water-abstraction through skin and mucous membrane—outer and inner covering ; hindering the regulation of vascular pressure.

2. Equability of temperature being disturbed by sudden or persistent falling or rising of the thermometer, the result is an inability on the part of certain persons, called "vulnerable," to adjust their sensations to the suddenly increased cold or heat. The changes to cold occur, of course, most frequently in cold (frigid) regions ; the changes to heat occur most frequently in hot (torrid) regions. In the temperate zone these differences co-exist with northern and southern latitude respectively.

3. Changes in barometric pressure are caused by the change in the quantity of moisture in the air and its temperature. Considering the immense pressure upon the surface of the human body, it is easy to understand how a deviation from the normal cannot be reacted upon by those of irritable circulation.

4. Here, then, we have factors calling upon increased adaptability by reaction of the vascular and nervous systems. The individuals who can least respond to this call are the so-called "vulnerable," and the chief characteristic

of vulnerability is an excitable condition of the vascular and nervous systems. In the action of blood-vessels controlled by the sympathetic nerves, this excitability is manifested by tendency to *extremes.* In cold climates, the statistics teach us, this extreme is *inflammation* more or less acute. In warm climates, as shown by statistics, the other extreme is reached—namely, stagnation, embolism, caseation, micro-necrosis, and *infection.*

5. Pulmonary consumption appears to our senses as the co-existence and co-operation of inflammation and infection ; both either acute or chronic. Chronic inflammation is seen in catarrho-fibroid phthisis (cirrhosis); subacute in the formation of cavities. Chronic infection is seen in localized tubercular invasion ; acute in miliary tuberculosis. The co-operation of inflammation and infection is seen in a cavity (excavation) or cirrhosis (condensation) being complicated by chronic septicæmia or acute tuberculosis ; and in chronic tuberculosis being complicated by subacute catarrh of the bronchioles.

6. Statistics establish the fact, that the tubercular form of consumption is by far most prevalent in the torrid zone; and that the inflammatory conditions of the air-passages, which may lead to consumption, are by far most prevalent in northern latitudes.

I have spoken of moisture as the "normal" ingredient of the atmosphere. As such, moisture is the only palpable constituent in the atmosphere, temperature and pressure being only impressions. Other ingredients are found in the air in sufficient quantity to attract our attention as pathological factors, and these are abnormal admixtures. They are dust, as inorganic matter; and vegetable and animal micro-organisms, as organic matter. Let it be well understood that comparatively small changes in the moisture of the atmosphere create great differences; while with the

abnormal ingredients small and infrequent quantities are harmless, quantity being a necessary hurtful element.

Dust is most frequent in the absence of warmth and moisture, and present with dryness. Micro-organisms, on the contrary, are most frequent in the presence of warmth and moisture.

Dust and germs in quantities, one as mechanical irritation, producing inflammation; the other a follower of tissue-death, and ushering in putrefaction, which is infection.

As such, then, they may be considered agents which may assist in the aggravation of pulmonary trouble. *The* cause which we know to be the immediate one of consumption is subsoil moisture, a fact fully established by Dr. H. I. Bowditch, of Boston.[1]

It is strange enough that this fact was not established long ago, when we consider that we have on one side, the individuals, on the other the soil and atmosphere, upon normal condition of which the inhabitants are dependent for health. Individuals range from the normally robust, through many shades, to the readily vulnerable, and all are likely to be exposed at some time or other.

Nothing is more natural than that the vulnerable in skin and mucous membrane should be more readily attacked. The lung is not only the sole organ of our body communicating openly with the outer world, but the one to inhale the atmosphere. Now, subsoil moisture is hurtful in that it furnishes a constant supply of surplus moisture to the atmosphere, and, though comparatively harmless when the ground is frozen, is a breeding-ground for germs in warm weather. A certain degree of warmth (37° to 42° C.) and a

[1] Bowditch: "Topographical Distribution and Local Origin of Consumption in Massachusetts," Med. Communications, Mass. Med. Soc., vol. x, 1862; "Consumption in New England and Elsewhere; or, Soil Moisture One of its Chief Causes," 1868.

certain degree of moisture we know to furnish the culture-ground for microscopic organisms.

Thus our knowledge and reasoning teaches us this: All meteorological causes of pulmonary consumption are found in the excess of the moisture admixture (aided by mechanical or micro-organic admixtures sometimes) and the extremes of temperature—heat and cold; moisture and cold being productive of the inflammatory part of the trouble, moisture and heat of the caseation—necrosis and infection.

Knowing, now, thus much of climatic causes of consumption, the persons whom it attacks, and the double form it assumes, we look for a climatic remedy in the opposite direction from the causes. In other words, we look in climatic treatment of consumption for a low percentage of moisture, fluctuations, and extremes of temperature—namely, *dryness and equability with coolness.*

So far we are all agreed. But when it comes to ascertaining where dryness and coolness are found in company, it is found that equability of temperature must be sacrificed, because dryness and coolness are found at elevated stations, where fluctuation of temperature is the law.

Again, if we wish to find equability, we find it in the dangerous company of moisture, and dryness is necessarily excluded.

Let us now reason in this way: We would like to find a combination of dryness, equability, and elevation. Elevation is found in all zones (torrid, temperate, and frigid). Dryness is found at distances from the ocean. Equability is found upon the ocean.

The worst form of consumption, the tubercular, is the product of the torrid zone, and it is a law that distance from the equator lessens liability to tubercular consumption. Therefore, we are to look for our prescription for distance from the equator and from the ocean.

In our part of the Western hemisphere this distance from the equator and from the ocean (the chief source of moisture) is, of course, far inland. But if we go straight north from the equator, we get into the frigid zone, and there meet with the second of our objections—extreme cold. If, then, the distance between the oceans be not great enough to insure the proper dryness (and it is not) we must look for increased distance in a vertical direction, and this is found at far inland high altitudes. Here we find both dryness and elevation, two of our desires, and have escaped the two enemies—moisture and extremes of temperature. So we may formulate: The avoidance of the causes of consumption, all of which are intimately connected with excessive moisture (of soil and atmosphere) and extreme heat or cold—but more particularly the former,—necessitate horizontal or vertical distance from the sources of these causes, namely, the vertical sun of the equator and the ocean.[1] These requirements of dryness with coolness are found at inland altitudes.

But what is to become of our equability? Well, we cannot have every thing good in one prescription. Still, if our judgment tells us that the sensations and resisting power of an anæmic patient are not to be trusted to a radical change, we must look for a palliative one, and we find it in equability of temperature. But let it be remembered that moisture must be taken with it,—more moisture than the patient has probably been accustomed to. It is the old fight of palliative and expectant treatment as against the radical cure.

[1] To understand what is meant by vertical distance as added to the horizontal one, it should be remembered that moisture arises from the whole surface of the globe—chiefly, however, from the ocean. Moisture arises immediately over the surface of large bodies of water, and spreads over adjacent land not much higher than the sea; the surface of the ocean (sea-level) being the true level surface of our globe. Some moisture arises from land also. Now, if I say that distance is increased by vertical measurement, it is intended to convey the truth that the combined moisture of sea and land hovering in the lower air-strata, have elevation to contend against, which elevation forces moisture to spread upward into space and thereby become diminished. In this sense a foot of vertical elevation is equivalent to the value of a number of miles of horizontal direction.

Palliative treatment at home delights in internal medication, and abroad in equability of temperature. Radical treatment delights in surgical procedure at home and dryness and elevation abroad.

The above is, I think, a clear and distinct statement of the facts in connection with the climato-therapy of consumption.

How does the profession of this country stand upon this question?

To properly understand the drift of various opinions, it should be kept in mind that, in the absence of any formidable array of favorable statistics in favor of certain climatic conditions, cure was, and is now, sought:

1. In the opposite of the causes of consumption.

2. In the climates where immunity among original inhabitants prevails.

The chief climatic conditions are: elevation (reduced barometric pressure); dryness (hygrometric); and equability (fluctuations of thermometer). In connection with these we speak of the temperature of various seasons (hot, warm, cool, or cold).

1. On account of *causes*: In the first half of this century Broussais' teaching of the inflammatory nature of consumption held sway. Cold weather was supposed to be the chief immediate cause of consumption. Hence, as stated on a previous page, temperature alone was made the curative test, and the opposite of cold—namely, warm climates—were chosen.

2. On account of *immunity*: This has been claimed at various times for elevation and certain degrees of temperature; dryness, strangely enough, attracting no attention. Inhabitants of high altitudes were shown to be exempt, until many exceptions were noted, all of which exceptions were at *moist* altitudes. Of temperature, the reverse of the

Broussais theory was seized, because, as was demonstrated, the inhabitants of the frigid regions were exempt. To this finding numerous exceptions were soon noted, and these exceptions again pointed to the prevalence of consumption in cold, *moist* climates.

Of exemption claimed on account of food, prevalence of other diseases (ague, etc.), we have no time to speak here.

Nor can more be said of immunity here, than that dryness, elevation, and equability (but not temperature *per se*) each have their share in insuring immunity; and that this is in accord with the causes of consumption also—of which subsoil moisture is the chief; while dryness is the chief antidote.

The writers of treatises upon the practice of medicine cling largely to making trial of warm and moist, cold and dry, etc., according to the sensations of the patient. So Dr. Loomis teaches that every consumptive has his climate; that his sensations must be consulted as to warm or cold, and the comfort or discomfort arising from moisture; and that a patient should remain where he finds himself improving.

Dr. Austin Flint teaches that warmth and moisture are, on the whole, to be preferred; that sea-voyages are frequently beneficial; that the analyses of several hundred cases does not permit him to establish any rules; and lastly, that all benefit of change of climate is due to the accessory circumstances of out-door life, freedom from care, good food, etc.

This abstract of the opinions of two leading medical men represents the belief of a majority of the medical profession, as regards choice of climate, I am sorry to say.

It was with a view to bring out the opinions of the profession with reference to climatic influences, and also to give renewed impetus to the climato-therapy of consumption,

that I addressed, now nearly a year ago, a circular letter to prominent men known to be interested in the subject.

The opinions of the profession in this country may be broadly divided into three heads:

1. Those who cling to the Broussais theory of selecting places on account of prevailing temperature—warm in summer, cool in winter.

(*a*). *Equability of temperature* (warm in summer, cool in winter), whose chief defender was the late Dr. F. D. Lente, of Palatka, Florida.

(*b*). *Equability of temperature*, a certain degree of, but not great, *dryness* insisted upon, with warmth and coolness.—Dr. W. H. Geddings, Aiken, So. Carolina.

2. Those who base their choice upon the supposed immunity in part established for inhabitants of *elevation*; for *dryness* and for *temperature* (*cold*).

(*a*). The claims of elevation are championed by quite a number at the present time, prominent among those who have written upon the subject being Dr. Charles Denison, of Denver, Colo., and Dr. H. V. M. Miller, of Atlanta. The former defends altitude immunity in connection with dryness.

(*b*). Immunity on account of a pretty *uniformly cold temperature*, with such dryness as far inland position naturally guarantees. This view is represented by the Minnesota physicians, prominent among whom are Drs. Talbot Jones, D. W. Hand, Franklin Staples, and Brewer Mattocks.

My questions had reference to the relative value of dryness, elevation, and equability of temperature. Of course it was not necessary to ask opinions about sunlight, electricity, rain-fall, etc., because they are dependent upon the three prime constituents.

I. ELEVATION.

Question 1st.—Do you believe elevation to be a necessary factor for a suitable climate for consumptives?

Question 2d.—If so, is it because you expect to find at altitudes fresh air in abundance only, or because the atmosphere is comparatively free from micro-organisms—an aseptic atmosphere?

Out of the eighty-six answers received[1] fully sixty knew of no evidence to prove the necessity of altitude in any class of cases.

Of the believers, a number drew my attention to the fact that there were various forms of phthisis; an unnecessary kindness, since I only wished to know if they had proof of the value of elevation in any class of cases. The "fresh-air-in-abundance" benefit at altitudes was embraced by the majority; some on the ground that we knew nothing of an aseptic atmosphere anywhere; others, that freedom from disease germs had never been shown to have a curative effect in pulmonary consumption.

"Elevation necessary only so far as it insures purity of atmosphere and absence of subsoil moisture; drainage is more facile."—Dr. Deering J. Roberts, Nashville, Tenn.

"Enforced exercise, as at Davos, is a very important factor."—Dr. Thos. F. Rochester, Buffalo, N. Y.

"For reasons of drainage and dryness of soil."—Dr. H. R. Hopkins, Buffalo.

"Only as it tends to secure the proper dryness."—Dr. Roswell Park, Chicago.

"Only as it gives dryness."—Dr. Alex. J. Stone, St. Paul, Minn.

"Because less dampness and less miasm there."—Dr. L. P. Yandell, Louisville, Ky.

"We are obliged to consider carefully the presence or absence of malaria."—Dr. Starling Loving, Columbus, Ohio.

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[1] For the detailed answers see *N. Y. Medical Journal.*

What are the established facts with regard to this question?

Have we a micro-germ specific to tubercle (and, inferentially, of consumption)? The bacillus tuberculosis of Koch has an existence in tubercle, lung cavities and infiltrations, and phthisical sputa.

Of its cultivation outside of the body through several generations, and the infection with it on previously healthy animals, we have, thus far, Koch's very carefully conducted experiments; true, upon animals which may be called susceptible or vulnerable.

Have we proof that ordinary bacteria of putrefaction (bacterium termo) are either found in the phthisical lungs or may be successfully introduced?

Yes, we have them in necrotic lung tissue (micrococci, too), but they do not, by inoculation, produce tuberculosis. The difference of appearance between the bacillus tuberculosis and the ordinary consists chiefly in form, and in the bacillus absorbing certain colors, which the common fellows do not do.

Have we proof of the existence of micro-organisms in the atmosphere? We have. It was my intention to cite the evidence in full for every question, but as this would lengthen this article beyond endurable limits, I must content myself by referring to observers. Cohn of Breslau, Naegeli, Wernich, and Brantlecht[1] have demonstrated not only the presence of germs in moist soil, but their conveyance into the atmosphere when bubbles are formed; and also floating in dust.

We are told that the various forms of micro-organisms

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[1] *Deutsche medicinische Wochenschrift*, No. 50, Dec. 9, 1882, p. 687.

"Floating Matter of the Air in Relation to Putrefaction and Infection," by John Tyndall, F. R. S., 1882.

"Bacteria." By Dr. Ferdinand Cohn. (Translation exists, by Dr. Dolley, of Rochester, 1881.)

"Lectures on the Relation of Micro-organisms to Disease." By Dr. Wm. T. Belfield.—*Medical Record*, Feb, 24, 1883, and subsequent numbers.

(micrococcus, bacterium, bacillus, vibrio, spirillum) float in intermitting clouds, so that there is no uniform distribution throughout the atmosphere.

What evidence exists as to their absence at certain altitudes, either on account of distance from sea-level, or because of dryness, with cool or cold temperature?

Nothing but deduction; no experimental proof. Professor Tyndall states that germs are incapable of rising above the lower air-strata. Cohn says (p. 28): "But they may be carried by the winds to unmeasurable distances, and also to extraordinary heights." The fact that heat and moisture are promoters of germ-life leads us to infer that dryness and cold are inimical thereto; but Cohn, among others, tells us that "experiments prove that even a chilling for many hours below eighteen degrees does not kill bacteria." Of course there can be no doubt that the congregation of human beings at altitudes lays the foundation for animal and vegetable putrefaction, and the accumulation of excrementitious matter.

Dr. Bowditch, of Boston, was correct, then, when he wrote to me, that these matters were entirely theoretical. Deduction gives us a probability; but thus far we lack all scientific experimental proof of the aseptic quality of high-altitude atmosphere.

Question 3d.—Have you reason to believe that reduced pressure of the air-column, such as exists at considerable elevations, has any decided therapeutical effect upon the human organism, independent of the purity of the atmosphere?

This question has been investigated theoretically as well as practically. Practically, very excellent results,—results which, I venture to say, have not been demonstrated by resort to any other climate, have been attained. I refer to the effect of altitude upon expansion of the lungs and

thorax, and upon the force and frequency of the heart's action.[1]

Both diseased and sound lungs have expanded in patients, as well as the lungs of well people, as shown by compensating hypertrophy and local emphysema, and increase in the measurements of the thorax in the antero-posterior and lateral diameters. Force of the heart's action is increased by prolonged residence, and frequency of pulse reduced. How this is accomplished has been in dispute for years. The question was whether more profound or more frequent respirations made up the difference between the quantity of oxygen of the air at sea-level in a given cubic space and the lesser quantity in the same space in rarefied air. This hair-splitting is very readily decided by examining the variety of results attained (some of them by myself), in which profundity of breathing and increased frequency are equally represented, the whole matter being one of *individual accommodation*, and always ending in the person's lungs and heart accommodating themselves to the changed surroundings.

Of those colleagues who attributed any effects to reduced pressure, some gave no reason at all; others argued on one side or the other of the above respiration question, but gave no experience of their own. Dr. Chas Denison, of Denver, Col., alone referred to the experiences of others and to his own, as published in his work on "Rocky Mountain Health Resorts."[2]

[1] "Treatment of Phthisis by Residence at High Altitudes." By Dr. C. Theodore Williams. Reprint, International Medical Congress, London, 1882. Other observers will be found noted there (p. 17).

"Le Mexique et L'Amerique Tropicale, Climate, Hygiene, et Maladies." By D. Jourdanet.

H. Weber, Klimatotherapie.—Allgemeine Therapie (Ziemssen).

Ornolles—De l' influence du climat des Andes sur la Phthise.

H. Weber.—Medico-Chirurgical Transactions, vols. iii and 52.

"Influence of Climate in Pulmonary Consumption." C. Theodore Williams. Lettsomian Lectures for 1876.

[2] See particularly page 128.

Dr. J. G. Westmoreland, Atlanta, Ga., said: "I think it injurious to those of diminished breathing capacity." We note, therefore, that demonstrable changes take place in the lungs and circulation of consumptives at high altitude, results which neither have been nor are attainable elsewhere. This I positively assert on the strength of my familiarity with the literature of climato-therapy of the past and present. We know that *these* results are not produced by constituents associated with inland altitudes—namely, dryness and coolness.

II. DRYNESS.

Question.—Do you agree with me in considering dryness a most potent factor in the climatic treatment of consumption?

This question was answered in the affirmative by nearly every one; and "dry and warm," "dry and cool," and "dry and cold," each had numerous admirers. There were a few who did not specify any other qualities of climate (elevation or equability) for any form of phthisis than is expressed in one of the above captions, without any reference to the fact that dryness below, or only slightly above, 50 per cent. of saturation, occurs only in connection with far inland medium or high altitudes.

Dr. Baumgarten, of St. Louis, qualified the benefits of dryness as being confined to those who are not irritable; the nervous not doing well in a dry climate.

"Dryness is a most potent factor, because the specific cause of the disease develops best in, and absolutely requires, moisture."—Dr. James T. Whittaker, Cincinnati.

"So far as I know, tubercular consumption is almost unknown in the driest climates."—Dr. Alfred Stillé, Philadelphia.

A large majority accepted dryness on condition that it be

not coupled to elevation, because of their knowledge that equability of temperature was supplanted by instability at high altitudes. Now, I submit that dryness at sea-level or low altitude is never real but only moderate—the monthly mean humidity is throughout above 55 per cent., seldom below 65. A glance at Vivenot's table gives an idea of what "dryness" means: [1]

Dry Climates,	Excessively dry,	1–55 %	relative	humidity.
	Moderately dry,	56–70 %	"	"
Moist Climates,	Moderately moist,	71–85 %	"	"
	Excessively moist,	86–100 %	"	"

In our zone the percentages of dryness, below or only slightly above one half saturation (50 per cent.), are found only at far inland medium or high altitudes. Putting their experiences and theoretical deductions together, the result was:

1. A two-thirds majority in favor of *equability first and dryness afterward*, which means sea-coast or low altitudes near the coast in southerly latitudes.

2. A minority in favor of dryness first and equability to this extent, that very moderate altitude only should be chosen, where moderate equability still exists.

What do we know of the effects of dryness? The practical results attained in dry climates cannot be separated from those attained at altitudes, and the value to be ascribed to dryness is only to be gotten at by comparison with the results of altitude without dryness (Rocky Mountains as against Adirondacks).

An exception to this general rule is found in the published results of fifty-five cases sent by Drs. C. J. B. and C. T. Williams to Egypt (dry without altitude),[2] in which the results were favorable. Another exception is in the case of

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[1] Ueber die Messung der Luftfeuchtigkeit—Rudolp v Vivenot.—*Schmidts' Jahrbuecher*, Band 132, p. 248.

[2] Medico-Chirurgical Transactions, vol. 55.

the tribes of the Kirghis steppes, where dryness is the only noteworthy climatic attribute.

Of the physiological results we know that the greater the amount of *absolute* humidity the greater are the conducting properties, and hence by readily conducting caloric humidity cools organic bodies. But temperature must be here considered. This cooling in the presence of excessive moisture in winter is not desirable, when it is already cold; and the heat of summer induces the production of sweat, which is checked by excessive humidity not permitting the atmosphere to take up any more, and hence a heating effect is produced upon the body. Dryness, by which we mean a low degree of humidity, does not conduct the caloric of the human body. When coupled to cold, vascular activity (where it exists) is called into full play; when coupled to warmth or heat, perspiration through the skin and the evaporation from the lungs is rapidly taken up into the dry air. This represents the equalization of the pressure of the vascular system by internal and external evaporation.

Just how much of a share dryness has in arresting active moist ulceration, casting off necrotic tissue by demarcation and thus setting up a healing process, can only be conjectured and judged by the results *in toto*. In very dry climates the sputa of consumptives should be microscopically examined at fixed periods, in order to ascertain what particles float in the serum.

Of the effects of shrinkage and desiccation, instead of the ushering in of moist putrefaction, we have ample evidence in the shrunken carcasses of animals on arid plains. Instead of destruction or excavation of juicy solids, there is shrinkage; instead of the evolvement of gases, there is absence of odor; in the absence of warmth and moisture together and the moist necrosis, there is an absence of the organisms of decomposition, which usher in putrefaction—

bacteria, micrococci, etc. Indirectly this is an argument for an aseptic atmosphere at elevations.

III.—TEMPERATURE.

We note *degrees* of warmth on the one hand, and *fluctuation*, presence or absence of stability, on the other. The first are the mean temperature degrees of a day, month, or year; the second the range, the number of degrees the thermometer fluctuates in a given time—which tells us of the equability of temperature. Heat, warmth, coolness, or cold, are the representative sensations conveyed to us by climates in various latitudes; southern latitudes in this zone being warm, northern cold.

Equability is governed by the possibility of land or water retaining the heat they have absorbed from the sun's rays in the daytime; which, in night-time, is kept from being radiated skyward by the moisture of the air. Hence equability and moisture are close relations. No climate, therefore, can be judged by, or has any effects on account of, its mean temperature alone, hot or cold simply denoting, broadly speaking, distance from the equator. That this distance may be horizontal or vertical has been explained, and again serves to show why high altitudes are naturally cool. Their lack of equability is due to lack of moisture in the air (dryness) and consequent radiation from the earth's crust at night, and their temperature is in part due to distance. Elevation may exist without dryness (Adirondacks); where then we have coolness and equability, but no dryness.

Temperature degrees, then, are the least important factors we have to deal with; and their range, marking the degree of equability, of greater importance though not in the same measure as dryness and elevation.

As stated in the previous paragraph on "dryness," by far the greater number of my correspondents looked upon

equability as the mainstay of climatic benefits. Equability with warm temperature and equability with coolness, each had about the same number of friends.

Dr. Alonzo B. Palmer says in his recent work on the "Practice of Medicine": "A particularly equable climate must not be insisted upon, except in bronchial and inflammatory cases, as equability presupposes moisture, which is far less favorable to the tuberculous condition." The most ingenious argument in favor of a cold climate with moderate dryness and no equability (Minnesota), was made by Dr. Talbot Jones, of St. Paul. His premises were that immunity from consumption was associated with temperature and with elevation. Of temperature, cold climates enjoyed comparative immunity; of elevation, more or less high altitudes insured equal immunity. This reasoning is not correct, because the premises are bad. In cold climates we find less tubercular consumption than in hot, but the acute inflammations, with all their direct and secondary effects in consumption, have their breeding-ground in cold, fluctuating climates.

Again, I have shown that it is not temperature which insures partial immunity in cold climates, but dryness secured by distance from the source of moisture—the great oceans. So with altitudes. Not elevation alone insures immunity, but dryness secured by increased distance from the ocean on the one hand and from the soil moisture at ordinary level on the other.

The defenders of medium and high altitudes (notably Dr. H. V. M. Miller, of Atlanta, Ga., and Dr. Chas. Denison, of Colorado) held that equability was of no value whatever in the majority of chronic cavities and infiltrations, though allowance was made for its necessity for the "irritable."

Dr. H. von Swearingen, of Fort Wayne, Ind., laid no

stress on equability, but contended that such dryness and plentifulness of air as are found at far inland prairies without elevation answered most requirements.

Dr. S. G. Armor, of Brooklyn, gave it as his experience that the usually asthenic form of consumption required at all times a cold, invigorating climate with or without elevation (Minnesota, Dakota, Montana).

As before stated, the champion of equability, with the avoidance of soil moisture and malaria, on account of the number of clear warm days insuring possibility of remaining in the open air, was Dr. F. D. Lente, of Palatka, Florida.

His neighbor, Dr. W. H. Geddings, of Aiken, is the Jas. Henry Bennett of our country. Equability with the greatest attainable dryness (moderate dryness) with coolness in winter, but without recourse to altitudes, is his gospel.

Both practical results and scientific reasoning are fast pointing to the choice of:

1. The greatest dryness obtainable, mostly found at

2. Medium or high altitudes. We look for these in a southerly latitude, in order to insure

3. Equability in some degree. To insure coolness in summer and winter, latitudes will have to be changed (southerly in winter, northerly in summer).

4. Equability with warmth or coolness to be made first choice only, in cases where decided irritability of any portion of the respiratory tract or a very recent inflammatory exacerbation are the main features of the case.

Sunshine, electricity, winds, precipitation and ozone are not directly concerned in climatic influences; firstly, because they are dependent upon the three previous constituents; secondly, because we know too little of the effects of either upon the human organism.

One point in reference to sunshine deserves attention.

The number of clear days is very great in very equable and in very dry climates; there is in both an abundance of sunshine. But the intensity of the sun, both in rarefied and unobstructed (by moisture) climates, is infinitely greater than where sea-level pressure of the air-column and denser moisture intercept the sun's rays.

SEA AND MOUNTAIN AIR.

Until within recent years, climates were chiefly spoken of as *marine* and *continental*. Equability is the chief element of marine climates, because, although heat is slowly absorbed by the ocean, it is retained by the moisture blanket hanging over it. Fluctuation, lack of equability, is the chief element of continental climates. Recognizing the percentage of moisture as the most important atmospheric constituent, it were better to speak of marine climates as moist with equability (warm, cool, or cold, as to temperature); and of continental climates as dry, with every range of fluctuation (and a warm, cool, or cold, temperature). It was out of deference to this old division, that I asked a question with reference to the respective merits of sea and mountain air.

Strangely enough, an overwhelming majority declared in favor of mountain air, including a considerable number of those who likewise looked upon equability as the chief desideratum. A few, who shall be nameless, declared in favor of mountain air *because* of its equability; opinions which were suppressed in the publication.

We have seen that Dr. Austin Flint ascribes great value to sea-voyages in some (unspecified) cases. Dr. Wm. T. Plant, of Syracuse, on the contrary, gave it as his extended experience, that no case of phthisis ever did well at sea for any length of time.

Dr. J. N. Danforth, Chicago, said: "Most cases are helped by sea-air, etc."

Of the disadvantages of sea-air, in connection with the sea-coast, Dr. H. I. Bowditch, of Boston, said: "I have no doubt that the sea-coast of New England and possibly of the Atlantic still farther south, *is always injurious to the consumptive at any period of the disease.*"

Mountain air as such has been discussed. What do we know of sea-air? Only that for absence of soil admixtures (additional moisture, dust, gases, micro-organisms), the chief direct causes of consumption, the broad ocean and inland mountain plateaux are both relatively free. Of salt air, acting as a mild antiseptic, we have no proof. Of the value of sea-voyages in cases of broken-down constitutions with moderate lesions, dependent upon this general condition, we have ample evidence in the writings of all authors.

More convenient than the vague definition of sea and mountain air, for the sake of comparison, are the more comprehensive terms of

SEDATIVE AND STIMULATING CLIMATES.

These designations include the three chief constituents of climate and the ruling temperature of the same.

Briefly, we may say that sedative, means: Equability of temperature with very considerable or with only moderate moisture, and in temperature hot, warm, or cool. Stimulating, means: Very great or moderate dryness with low, medium, or high altitude, and in temperature cool or cold, according to latitude.

The question to my correspondents as to their preference for sedative or stimulating climates for the various forms of phthisis was perhaps the best one to bring out as complete an answer as possible; the more, as I named certain localities in connection with each kind of climate. This brought out a much greater unanimity of opinion than might have been expected.

With few exceptions, mostly previously quoted, the

opinion is unanimous, that where decided irritation of mucous membrane (and skin) and tendency to or recent recovery from active inflammation supervened, a sedative climate was indicated.

This was expressed in various ways, Dr. Glasgow, St. Louis, speaking of "tendency toward inflammations of mucous membranes." Dr. Baumgarten, of the same city, "only for nervous, erotic persons." Others spoke of conditions of irritation and liability to inflammatory exacerbation and hemorrhage as "irritable bronchi," "pneumonia cases," "irritable cavity," or "irritable air-passages." The unanimity was marred by two facts:

1. That a great number preferred for this class of cases a warm instead of a cool temperature, with the equability.

2. That only a minority agreed with me as to the propriety of considering sedative climates only as an expedient; as a palliative, which was to serve as a stepping-stone to medium and high altitudes, in order that the well-known effects upon the thorax and circulation might be insured, after decided irritation or tendency to inflammation of mucous membranes had been in a measure reduced.

The stimulating, tonic climate as such (dryness as the leading attribute, altitude or none, and a cool temperature) was accepted by a two-thirds majority as the climate for the average chronic case of consumption, of excavations in the shape of cavities, or condensations in the shape of infiltrations, with slow but persistent progress, no recent exacerbations or well-marked irritation—the commonest presentation of pulmonary consumption. Of American authors we have seen that Dr. Loomis[1] and Dr. Flint[2] both rest the decision as to the proper climate upon the sensations of the

[1] Loomis: "Diseases of the Respiratory Organs," 1882.

[2] Flint: "On Phthisis," 1875.

patient, both as regards dryness and the degree of temperature (warm, cool, or cold). Dr. Loomis sees a climate for every patient: "The experiences of the individual is the only safe guide in the choice of a locality best suited to his or her own case." Dr. Flint: "Whether a cold is to be preferred to a warm climate, in particular cases, must depend upon the predilections of a patient, the past individual experience as regards the relative effect of cold and warm weather on the feelings and the general health, etc."

Dr. Roberts Bartholow,[1] and Dr. A. B. Palmer,[2] both declare for dryness and elevation; with the exception, of course, of the irritable and inflammatory cases.

In regard to the stages of development in which climatic treatment is likely to result in benefit, the above four authors are pretty well agreed that it is confined to the first stage.

This, too, is the opinion of about one half of my correspondents. The other half, on the contrary, see in dryness, medium or high altitude, with coolness, remedies not sufficiently tested on second-stage cases.

The answers to the question of the most suitable localities in this country and abroad, included every region or station of note, either as being equable or dry, with little or considerable altitude. The details will be found in the *N. Y. Medical Journal* (June 9, 16, 23, and 30, 1883).

As to a change of location or latitude, or both, opinions were equally divided into: Those who would have patients remain permanently in the place where they are benefited; those who preferred south in winter and north in summer; and those who were of the opinion that patients should graduate from lower to higher altitudes.

Nothing would be more interesting than the carefully

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[1] Bartholow: "Treatise on the Practice of Medicine," 1880.

[2] Palmer: "Practice of Medicine," 1882.

gathered results of experience from equable, dry, and elevated stations respectively. As this would involve detailed cases, with a history of their progress from time to time, I contented myself this time with asking what each one could say of the general results of climato-therapy. The result was as follows:

1. About thirty reported cases and permanent arrests in encouraging numbers, as the result of their experience. Of these, eighty per cent. were of those who preferred dryness with moderate or high altitude for the average case of slowly progressive excavation (cavity) or shrinkage (infiltration).

2. Temporary arrest and "prolonged life" was reported by sixty-two; about equally distributed between equable climates and altitudes.

3. One fourth of the whole number had no encouraging results to cite; some were "discouraged," others "confused," and finally there were those who had "no faith in climato-therapy."

Let us briefly summarize what we positively know of the effects upon pulmonary consumption of the climatic constituents of elevation—dryness and equability,—both from practical experience (published only in part) and from the teachings of climatology.

1. *Elevation.* Practically: Numerous cures recorded, where, however, in some cases, altitude cannot be separated from dryness. Effects on thorax, lungs, and heart noted. A relatively aseptic condition of atmosphere at elevations not experimentally proven; effects of reduced barometric pressure proven by widening of thorax, etc.

2. *Dryness.* Practical results: In Egypt, where dryness prevails and altitude is excluded;[1] results at Aiken, S. C., and at altitudes, as mentioned above. Absence of putre-

[1] *Medico-Chirurgical Transactions*, vol. 55, London.

faction, supplanted by dry shrinkage without organisms of putrefaction and consequent chemical decomposition in dead animals. Effects upon equalizing blood-pressure by evaporation from lungs and skin.

3. *Equability.* Practical results: Allaying of irritation and of recent inflammation. Many proofs of temporary arrests, few of permanent cure. Bettering of general condition and, with it, of troubles dependent thereon. As equability excludes cold, the sensations are soothed; skin and mucous membrane do not shrivel and chill. Possibility of being out-of-doors great, but absence of all stimulating qualities of air; rarity of atmosphere and a cool or cold temperature.

The following tables of the meteorological data of various stations throughout the United States, copied from the Report of the Chief Signal Officer, are intended to show where, and in connection with what other constituents, equability and dryness are to be found. The localities named do not represent the best health stations, as only few of the latter are supplied with signal stations:

I.—EQUABILITY.

a.—Cold, Summer and Winter.

Unalashka, Alaska.

1878-'79-'80.	Range.	Mean.	1878-'79-'80.	Range.	Mean.
January . . .	16°	34°	July . . .		
February . .	16	29	August . .		
March . . .	22	32	September .		48°
April	22	33	October . .		40
May	13		November .	27°	33
June			December .	26	35

Mean relative humidity, 92 %; excessively moist.

b.—Warm, Summer and Winter.

San Diego, California.

1879-1880	Range.	Mean.	1879-1880	Range.	Mean.
July	17°	65°	January . .	41°	51°
August . . .	30	68	February . .	28	50
September . .	38	66	March . . .	31	52
October . . .	46	62	April . . .	38	57
November . .	36	55	May . . .	38	61
December . .	39	53	June . . .	21	63

Mean relative humidity, 72.4 % ; moist.

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c.—Hot, Summer and Winter.

Key West, Florida.

1879–1880.	Range.	Mean.	1879–1880.	Range.	Mean.
July	19°	84°	January . .	18°	73°
August . . .	19	84	February . .	19	73
September . .	18	82	March . . .	24	76
October . . .	15	79	April . . .	24	76
November . .	24	74	May . . .	20	79
December . .	15	74	June . . .	22	83

Mean relative humidity, 74.4 % ; moist.

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d.—Warm in Summer, Cool in Winter.

Cape Lookout, North Carolina.

1879–1880.	Range.	Mean.	1879–1880.	Range.	Mean.
July	22°	78°	January . .	33°	54°
August . . .	24	77	February . .	34	53
September . .	25	72	March . . .	34	55
October . . .	37	69	April . . .	37	60
November . .	47	55	May . . .	30	70
December . .	36	56	June . . .	26	75

Mean relative humidity, 78.5 % ; moist.

2.—DRYNESS.

a.—High Altitudes.

Cool in Summer, Cold in Winter.

Cheyenne, Wyoming Territory.

Elevation, 6,089 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	41.4 %	69°	January .	38.7 %	30°
August . .	39.5	65	February .	50.7	24
September .	29.3	58	March .	42.0	27
October . .	33.0	46	April . .	33.3	41
November .	39.7	35	May . .	28.4	53
December .	47.9	25	June . .	37.5	62

Annual range (max., 94° min.—24°), 118° ; very unequable.

Warm in Summer, Cool in Winter.

Santa Fe, New Mexico.

Elevation, 6,970 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	38 %	69°	January .	44 %	30°
August . .	35	68	February .	47	26
September .	27	62	March .	41	34
October . .	41	49	April . .	40	45
November .	46	37	May . .	21	58
December .	49	28	June . .	20	67

Annual range (max., 95°, min.—13°), 108° ; very unequable.

Pioche, Nevada.

Elevation, 6,220 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	13 %	75°	January .	55 %	30°
August . .	17	74	February .	55	27
September .	13	69	March .	45	34
October . .	30	51	April . .	41	45
November .	40	38	May . .	16	57
December .	58	30	June . .	15	68

Annual range, 108° (max., 95°, min.—13) ; very unequable.

b.—Medium Altitudes.

Warm in Summer, Cool in Winter.

Salt Lake City, Utah Territory.

Elevation, 4,354 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	20 %	78°	January .	45 %	28°
August . .	21	76	February .	49	26
September .	17	68	March .	42	33
October . .	39	51	April . .	44	47
November .	47	36	May . .	37	55
December .	56	29	June . .	24	67

Annual range, 107° (max., 97°, min.—10°); very unequable.

Hot in Summer, Cool in Winter.

La Mesilla, New Mexico.

Elevation, 4,124 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	46 %	79°	January .	44 %	45°
August . .	38	78	February .	45	42
September .	34	74	March .	33	52
October . .	48	61	April . .	19	61
November .	36	48	May . .	23	71
December .	38	44	June . .	28	79

Annual range, 88° (max., 104°, min.—16°); not equable.

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c.—Low Altitude.

Hot in Summer, Cool in Winter.

Red Bluff, California.

Elevation, 338 feet.

1879–1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	31 %	82°	January .	67 %	44°
August . .	31	83	February .	58	46
September .	34	77	March .	46	50
October . .	48	63	April . .	67	56
November .	63	50	May . .	54	65
December .	73	44	June . .	37	76

Annual range, 84° (max., 110°, min.—26°); not equable.

3.—DRYNESS AND EQUABILITY.

Warm in Summer, Cold in Winter.

Winnemucca, Nevada.

Elevation, 4,345 feet.

1879–1880.	Relative Humidity.	Range.	1879–1880.	Relative Humidity.	Range.
July	18 %	34°	January . .	58 %	20°
August . . .	19	36	February . .	64	22
September . .	17	39	March . . .	55	24
October . . .	43	31	April . . .	52	24
November . .	60	26	May . . .	33	28
December . .	70	17	June . . .	17	35

Mean summer temperature, 63°; mean winter temperature, 33°.

4.—EQUABILITY AND MODERATE DRYNESS.

Warm in Summer, Cool in Winter.

Los Angeles, California.

1879–1880.	Range.	Relative Humidity.	1879–1880.	Range.	Relative Humidity.
July	32°	69 %	January . .	46°	70 %
August . . .	44	77	February . .	37	65
September . .	54	74	March . . .	37	71
October . . .	54	71	April . . .	43	63
November . .	48	69	May . . .	55	70
December . .	46	74	June . . .	33	73

Mean summer temperature, 65°; mean winter temperature, 43°.

5.—MODERATE DRYNESS.

Cool in Summer, Cold in Winter.

Saint Paul, Minnesota.

1879-1880.	Relative Humidity.	Mean Temperature.	1879–1880.	Relative Humidity.	Mean Temperature.
July . . .	68 %	73°	January .	71 %	26°
August . .	67	70	February .	65	20
September .	65	57	March .	63	29
October . .	61	57	April . .	59	45
November .	66	32	May . .	61	63
December .	66	11	June . .	67	68

Annual range, 112° (max., 92°, min.—20°); very unequable.

6.—MODERATE DRYNESS AND MODERATE EQUABILITY.

a.—Medium Altitude.

Warm in Summer, Cool in Winter.

Atlanta, Georgia.

Elevation, 1,131 feet.

1879-1880.	Relative Humidity.	Range.	1879-1880.	Relative Humidity.	Range.
July	63 %	32°	January . .	70 %	41°
August . . .	73	34	February . .	58	43
September . .	64	42	March . . .	62	43
October . . .	71	47	April . . .	63	50
November . .	68	52	May . . .	64	42
December . .	70	54	June . . .	60	34

Mean summer temperature, 70° ; mean winter temperature, 54°.

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b.—Low Altitude.

Hot in Summer, Cool in Winter.

Corsicana, Texas.

Elevation, 445 feet.

1879-1880.	Relative Humidity.	Range.	1879-1880.	Relative Humidity.	Range.
July	56 %	33°	January . .	67 %	46°
August . . .	57	39	February . .	62	53
September . .	54	41	March . .	69	61
October . . .	57	52	April . . .	59	56
November . .	58	58	May . . .	68	43
December . .	62	66	June . . .	67	33

Mean summer temperature, 79° ; mean winter temperature, 58°.

GUDDEN'S ATROPHY METHOD: AND A SUMMARY OF ITS RESULTS.

(*Second Paper.**)

By E. C. SEGUIN, M.D.

(*With two wood-cuts.*)

DURING the month of October of this year I went to Munich specially to see Professor von Gudden's preparations illustrating the various propositions advanced in this analysis, and he very kindly showed them to me himself with the greatest patience and system. I must also thank Dr. Ganser for his courteous assistance in the laboratory, more especially with respect to details as to various points of *technique*.

Before proceeding to continue the enumeration of Gudden's and Ganser's discoveries, it is necessary to insert corrections and additions relative to two topics treated of in the first paper.

First,[1] as to the pars olfactoria of the commissura anterior. Professor von Gudden has recently been led to return to his former view (against Ganser), that this commissure does not unite the *bulbi* olfactorii, but the *lobi* o. To understand the experimental results, one must have a clear idea of Gudden's view of the anatomy of the rabbit's olfactory bulb. He considers the true bulb structure to sit like a cap over the projected extremity of the lobus olfactorius; in other

* *Vide* ARCHIVES for October, p. 126. [This paper should have appeared as editorial matter, but was placed among original papers because the editorial space had been engaged.—ED.]

[1] Unpublished.

words, a portion of cerebral cortex is inclosed within the bulb proper. Consequently it is impossible to remove the bulbus olf. without also injuring or removing a portion of cerebral cortex and white substance.

EXPT.[1]—The lobus olfactorius is simply separated by incision from its connections with the brain. The skull is not opened, and no nervous substance removed. Autopsy shows that the separated bulbus, though smaller, has retained its vitality, and the olfactory nerves are normal. Trans-sections and horizontal sections give the following results :

In the bulbus there is no positive atrophy of its essential elements. In the olfactory lobe of the cerebrum (inferior part of frontal lobe) there is distinct though slight atrophy, in size and number, of ganglion cells in the cortex. In the centre of the bulbus (inclosed cerebral substance) the white substance is much atrophied. The tractus olfactorius shows much atrophy of its white substance, more especially the lateral fibres.

Contrary to Ganser, the pars olfactoria of the C. A. is to a great extent preserved. Some fibres are atrophied (absent), viz.: those which in the normal state extended into the intra-bulbar projection of the olfactory lobe, which was cut off by the incision.

Consequently von Gudden holds that the pars olfactoria of the commissura anterior connects two lobi olfactorii, a view which is just as much opposed to Meynert's hypothesis as the former was.

Second, an addition to the anatomy of the optic apparatus. Last year[2] von Gudden presented to the Science Congress at Eisenach a *résumé* of more recent experiments upon the various constituents of the optic apparatus. He repeated his demonstrations that the commissura inferior cerebri and the hemispheric fasciculus of the tractus opticus (*vide* ARCHIVES OF MEDICINE, October, p. 139) are not directly connected, physiologically, with the visual apparatus.

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[1] To save repetition it is to be understood, unless specially otherwise stated, that the experiments cited in this paper are made upon newly-born rabbits, which are allowed to live many months before autopsy.

[2] Ueber die verschiedenen Nervenfasernsysteme in der Retina und im Nervus opticus.—*Tageblatt der* 55 *Versammlung der Deutschen Naturforscher und Aerzte*, Eisenach, 1882.

He laid the results of new experiments before the Association with reference to:

1. The relations of the hemispheres to vision. If one hemisphere, even inclusive of its corpus striatum, be removed from a newly-born rabbit, it is impossible, after the animal has become adult, to detect any impairment of sight; and both the pupils react normally. Gudden does not generalize from this fact; he simply advances it as true in rabbits. He calls attention to a possible explanation of the conflict between this result and Munk's conclusions, by the fact that Munk always operated on adult animals (or, at least, not on the newly-born) whose cerebrum has acquired certain functional attributes absent at an early period of life.

2. Centre of pupillary movements. He condemns as erroneous his former statement, that after removal of one lobus opticus the opposite was abnormal.

(*a*) If one successfully removes the superficial layers of one lobus opticus with a sharp spoon, it is observed that the animal is absolutely blind in the eye opposite the lesion, but the pupils are both normal in appearance and movements. Post-mortem examination shows that the optic nerve opposite the lesion is reduced in size, but is white and contains normal fibres. The retina shows a general diffuse reduction in the number of its nerve fibres. The tractus ped. transversus on the operated side is normal. On careful examination one sees a little latero-frontad of the injured lobus opticus a small eminence, more prominent than on the opposite normal side. The eminence is rendered more distinct by partial atrophy of fibres of the tractus opticus.

(*b*) If, in a newly-born rabbit, we remove one lobus opticus, together with the above-described eminence, the adult animal shows blindness of the opposite eye with wide dilatation of its pupil—a dilatation which is only slightly af-

fected by the strongest daylight. The optic nerve and retina are as described *supra*, but the tractus peduncularis trans. on the operated side is completely atrophied.

Thus two "centres" are demonstrated: one in the lobus opticus, for vision; the other a little frontad of it, for reflex pupillary movements.

3. The corpus geniculatum laterale is a third "centre," probably a trophic centre for the optic tract and nerve, since after its removal these parts undergo atrophy just as after enucleation of one eyeball [except that the direct (lateral) optic fasciculus remains normal in the former case]. The various experiments bearing upon this question are not yet complete.

4. If portions of one lobus opticus be removed, there are found various segments of localized retinal atrophy (in contradistinction to the diffuse atrophy noticed after removal of the whole lobus opticus). Experiments upon this further differentiation of nerve fibres are in progress.

5.[1] Within a year Gudden and Ganser have been successful in dividing the optic chiasm longitudinally by passing a long narrow-bladed knife through the unopened skull and brain at the vertex.

Results: Complete atrophy of crossed fasciculi of optic chiasm, with preservation of the lateral fasciculi-commissura inferior atrophied bilaterally.

I pass on now to studies in other regions of the nervous centres, continuing the enumeration begun in the former paper.

V.—Demonstration of the pyramidal tract.[2]

In 1871, soon after the publication of Hitzig's first experiments on the cerebral cortex, von Gudden removed the

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[1] Unpublished.

[2] Ueber Dementia Paralytica.—*Correspondenzblätt f. Schweizer Aerzte*, Bd. ii, p. 79, 1872.

frontal portion of one hemisphere (including the "motor centres") in newly-born rabbits. Preparations from the adult brain showed atrophy of the corresponding crus cerebi and anterior pyramid. The date of this experiment is noteworthy; it was certainly anterior to Flechsig's publications,[1] and is the first demonstration of the continuity of the motor or pyramidal tract from the cerebral cortex caudad. The experiment has since been repeated on the dog with even more striking results. Specimens from the dog I was able to examine. They showed, caudad of the atrophied cerebral area, a complete absence of the medial division of the crus cerebri, of the pyramidal fasciculi in the pons, and of the pyramid strictly speaking. Below the decussation the atrophy can be traced in the postero-lateral column of the opposite side. The anterior columns are unchanged. The lemniscus (*schleife*) is also much atrophied on the operated side (compare statements in paragraph on fasciculus ad tegmentum, *infra*).

VI.—Connections of the cerebellum.[2]

EXPT.—In a newly-born rabbit one half of the cerebellum was removed. At the autopsy of the adult animal it was found that a very small part of the lateral portion of the hemisphere remained attached to the medulla.[3] A full series of trans-sections was made and studied. Results:

1. In the upper cervical region complete atrophy (absence) of the fasciculus ad cerebellum[4] (*Kleinhirnseitenstrangbahn* of Flechsig) on the same side as the lesion.

2. In the caudal part of the medulla, we find likewise on the same side as the injury: (*a*) atrophy of a group of cells lying ventral in the medulla ("nucleus of anterior columns"), and of

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[1] Yet Flechsig, in his most recent publication ("Plan des Menschlichen Gehirns," p. vii, note; Leipzig, 1883), still claims the demonstration as his.

[2] Ueber die Verbindungsbahnen des kleinen Gehirns.—*Tageblatt der* 55 *Versammlung der Deutschen Naturforscher und Aerzte*, im Eisenach, 1882.

[3] It was also found that one post-optic lobe was much injured, and that the corresponding crus cerebri had been touched by the spoon.

[4] I would propose this term, fasciculus ad cerebellum, for the ascending cerebellar fasciculus. It is in harmony with the names of adjacent centripetal bundles, viz., the fasciculus cuneatus and the fasc. gracilis.

(*b*) a second cell-group lateral in the medulla but ventrad of the trigeminal root, the so-called "nucleus lateralis," from its supposed connections with the lateral columns. In this region the fibræ arciformes which go to form the beginning of the corpus restiforme are absent.

d. Sections further frontad in the medulla show atrophy of another nucleus on the same side as the injury, one situated dorsad of ascending root of N. v. At level of N. vii there is complete absence of the corpus restiforme.

4. In the various sections of the medulla it is seen that the olive of the side *opposite* the lesion is almost wholly atrophied; a small part of it is still seen in the caudal sections, and probably its survival is due to the bit of cerebellum which was left in the operation.

5. Sections in the region of N. viii, and further frontad, show a normal state of this nerve, of the upper olives, trapezium, and of the (falsely) so-called "external auditory nucleus," or Deiters' nucleus. The inner division of the processus ad medullam is about normal; while, as already stated, its outer portion, or corpus restiforme, is totally (?) atrophied.

6. Sections through the upper part of the pons Varolii show absence of processus ad pontem, without atrophy of trapezium or of upper olives. It is exceedingly difficult to determine the connections of the atrophied fibres, but many of them were certainly in the opposite half of the pons, a few in the corresponding half, and others were true commissural fibres.

7. Sections further frontad show absence of the processus ad cerebrum on the operated side. The cells of the descending root of N. v are absent. Further on the nucleus tegmenti of the opposite side is almost entirely atrophied. The few cells remaining are to be considered as evidence that another fasciculus probably arises from the nucleus tegmenti and proceeds frontad. That this survival of a few cells is not due to incomplete decussation of the processus ad cerebrum is shown by the absolutely normal state of the other nucleus: were there a semi-decussation, both nuclei would exhibit atrophy. The preserved cells of the nucleus tegmenti are large, and are situated laterad of roots of N. iii. Further frontad the number of cells in both nuclei tegmenti become equal.

Consequently it may be stated that:—

1. The processus ad medullam (or corpus restiforme) has

four origins, viz.: in three cell-groups or nuclei on the same side in the medulla oblongata, a dorsal, a lateral, and a ventral nucleus[1]; it is also derived from the olive of the opposite side.

2. The processus ad pontem arises chiefly from cells in the opposite half of the pons. It does not give fibres to the pyramidal tract. Prof. Gudden does not consider his researches on this point concluded.

3. The processus ad cerebrum proceeds frontad, as is well known, and wholly decussates with its fellow, and has its cell-connections in the caudo-medial part of the opposite nucleus tegmenti.

VII.—Connections of the processus ad cerebrum.

In 1881, my friend, Prof. A. Forel, of Zürich, presented to the German Science Congress at Salzburg the results of a most interesting experiment upon this organ.[2]

Expt.—In a newly-born rabbit the right processus ad cerebrum, the right side of velum medullare anterius, post-optic lobe, and (involuntarily) a small bit of the right processus ad pontem were removed.

Results: Atrophy of remaining (caudad and frontad of wound) fibres of processus ad cerebrum. The atrophy is easily traced frontad across the median line to the left nucleus tegmenti, which is largely atrophied, more especially in its caudal part. Sections frontad of nuclei tegmenti show no lesions. The ventral decussation of the tegmentum (*ventrale Haubenkreuzung*) is slightly unequal on the two sides.

But it is in the sections caudad of the injury that the most interesting fact is found.

The right half of the vermis superior is extremely atrophic; some fasciculi going to the nucleus dentatus are visibly atrophied. The nuclei (dentatus, dectiformis, embolus), as well as the corpus restiforme, are perfectly normal.

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[1] This last was known to Deiters as an origin for fibres for the corpus restiforme, and Prof. Gudden has called it Deiters' nucleus; but as this term has been more generally applied to the remarkable group of large cells which are in seeming relation to the acoustic nerve, he will abandon the name.

[2] Sitzungsberichte der 54 Versammlung Deutschen Naturforscher und Aerzte, im Salzburg, 1881. In *Wiener med. Zeitung*, No. 46, 1881.

Other lesions noted are: In consequence of the removal of the post-optic lobe, there is a reduction in the volume of the right lateral lemniscus (*Schleifenschicht*) as far caudad as N. vii. Further caudad no lesions. There is slight atrophy of the so-called crus of the post-optic lobe as far frontad as the corpus geniculatum mediale, which seems normal. The only change in the lobi optici is a very slight reduction of the deep white layer on the right side. The r. descending root of N. v is almost entirely absent, a few cells remaining at the level of the exit of the nerve. N. viii is normal, as is also the fountain-like decussation (*Fontaineartige Kreutzung* of Forel) in the tegmentum, which Meynert and Wernicke would associate with N. v.

The important conclusion drawn from this experiment is that the processus ad cerebrum arises in the vermis superior of one side, and terminates (wholly?) in the nucleus tegmenti of the opposite side.

VIII.—Central connections of the sciatic nerve.

This subject has been studied by means of Gudden's method by his pupil and assistant, Mayser.[1] He gives a detailed account of the histology and architecture of the rabbit's spinal cords. Then he takes up the study of some cords from which the sciatic nerve had been separated immediately after birth, two by extraction of roots, and one by section of the nerve.

The lesions found in the spinal cord are similar in nature and general distribution, but more extensive and distinct in the cases of extraction.

Results: *White substance.* The only marked change is in the posterior columns of the lumbar enlargement, which are reduced in size on the same side as the injury. The fasciculus cuneatus is alone atrophied, and this lesion gradually diminishes in the dorsal region. In my examination of the specimens I observed in the lumbar region com-

[1] P. Mayser: Experimentaller Beitrag zur Kenntniss des Baess des Kaninchen-Rückenmarks. Inaugural Dissertation.—*Westphal's Archiv für Psychiatrie*, Bd. vii, Heft iii, 1877.

plete absence of the posterior root zone on the injured side. The posterior part of the lateral column is also very slightly reduced in size.

The *gray substance* shows the greatest atrophy. At level of greatest lesion, the anterior gray horn is much reduced in size, and has lost its quadrangular shape, and is barren of ganglion cells. Higher up the postero-lateral group of cells is preserved, especially in the cord of the animal whose sciatic had been simply divided. Some ganglion cells on the side opposite the injury, those sending cylinder-axis processes toward the commissura anterior, must have perished, for they are fewer in number than the same cells on the injured side (evidence of crossed origin of some fibres of sciatic). The posterior horn on the injured side is about one third smaller than normal; still it contains many small ganglion cells, and the difference is mainly in the fibre-system. The substantia gelatinosa is much atrophied, but shows only a small reduction in the number of its cells. The two commissures are reduced in size, the posterior more so.

Essentially similar lesions were found in the cervical spinal cord of a rabbit whose brachial plexus had been extracted.

IX.—Nuclei of the cranial nerves.[1]

From personal examination of specimens.

NN. iii and iv. Expt.—Extirpation of the eyeball in a newly-born rabbit, with careful extraction of orbital nerves.

Result: Atrophy in various parts of optic apparatus, as described *supra*; complete atrophy of NN. iii, iv, and vi. Series of trans-sections enable us to study the deeper atrophy of the nuclei of these nerves.

[1] Prof. v. Gudden has made no systematic publication of these valuable results. Here and there in his papers he refers to the facts which have long been known to him; many prior to 1872, as shown by their citation in Kondracki's Zürich thesis.

1. N. iii.[1] Nucleus in well-known location, caudad of lobus opticus and dorsad of fasciculus longitudinalis posterior. By Gudden's method the nucleus is made out to be triple.

(*a*) A fronto-ventral nucleus lying upon the fasc. long. post., and giving origin to fibres which pass ventrally in a straight direction.

(*b*) A caudo-ventral nucleus, partly dorsad of (*a*), overlapping it somewhat, but also extending (in its caudal part) down to the fasc. long. post. This cell-group also gives rise to direct vertical fibres.

(*c*) A caudal nucleus lying dorsad of (*b*), not reaching the level of the fasc. long. post., and separated from the nucleus of N. iv by a distinct barren interval. This contains and gives origin to decussated and horizontally coursing fibres.

In a normal preparation, a horizontal section made just dorsad of the fasc. long. post. shows cells of nuclei (*a*) and (*b*) and cross-cut nerve fibres. One made further dorsad, passing through nucleus (*c*), shows cells and mostly horizontally running nerve fibres.

Similar sections from an animal experimented upon as described above shows : the ventral section's absence of fibres and cells on the same side as the injury ; the dorsal section, on the contrary, exhibits atrophy (absence) of cells and horizontal fibres on side opposite the injury.

The decussation of the fibres of N. iii occurs mostly by the lateral fibres of the root, which pierce the ventral nuclei, then turn pretty sharply mediad and decussate with their homologues to connect with cells in the dorsal nucleus of the opposite side. A few fibres decussate to reach this nucleus through the raphe. The large majority of the root-fibres of N. iii, constituting the medial roots, arise from (*a*) and (*b*) and pass out directly.

[1] *Vide* a short communication in Mittheilungen der Morphol.-Physiol. Gesellschaft zu München, in *Münchner Aerztlichen Intelligenzblätt*, 1883.

Prof. von Gudden anticipates that by a better method of extirpation of single ocular muscles with their attached nerve filaments, we may yet be able to define a greater differentiation of cell-groups in the oculomotor nuclei. In this connection it is well to mention that in studying the atrophied N. iii nuclei, the displacement produced by atrophy of the two ventral nuclei on the side of the injury must be borne in mind. In consequence of the virtual void thus caused, the dorsal nucleus is displaced downward or ventrally, and the fasc. long. post. in a dorso-mediad direction. Prof. Gudden has long ago appreciated and called attention to this source of error in studying sections from regions atrophied by his method. We will see other illustrations of this further on (*vide* corpus mammilare and von Monakow's researches on the thalamus).

2. N. iv. Its nucleus lies caudad of the caudal nucleus of N. iii, and extends down to the fasc. long. post. In pathological brains, sagittal, horizontal, and trans-sections show that the atrophy involves only one nucleus, always the one on the side opposite the injury. Consequently N. iv has a simple origin, and its root-fibres wholly decussate.

3. N. v.[1] Two series of preparations were shown me: 1. Trans-sections from the nerve centres of a rabbit whose trigeminus on one side had been cut between the pons Varolii and the ganglion Gasserii; the operation was done by the old intracranial method, and was not entirely successful. In the sections, a partial atrophy of the ascending root can be traced frontad from a point between the second and third cervical nerve to the level of exit of root. The descending root and its peculiar cells also show marked atrophy. The motor nucleus and root are, on the contrary, well preserved. 2. Series of trans-sections from the nervous centres of a calf presenting extensive malformations and atrophies of the brain.

[1] Unpublished.

The principal lesions presented by this brain, as exhibited in a drawing of its basis, were: (1) absence of right olfactory nerves and tractus (bulb partly preserved); (2) complete absence of both optic nerves and tractus, with preservation of the commissura inferior; (3) partial atrophy of right N. iii; (4) preservation of both NN. iv; (5) root of right N. v seems totally atrophied, while its ganglion and peripheral branches are preserved; (6) absence of both NN. vi; (7) preservation of both NN. vii and of the other nerves caudad

Sections from the level of second cervical nerve to that of lobus opticus examined: On the right side there is complete absence of the ascending (spinal) root of N. v throughout its entire extent. The motor nucleus and root are likewise completely absent. Of the descending root a few cells exist, and a few fibres from them can be traced caudo-ventrad toward the exit region of nerve-trunk.

From these specimens (and others) Gudden is willing to recognize only three roots of the trigeminus, two sensory and one motor. The other roots, as given by Meynert and others, he regards as imaginary.[1]

4. N. vi. Expt.—Described in paragraph on N. iii. Trans-

[1] In this connection it may be interesting to refer to von Gudden's numerous and ingenious experiments on the question of the trophic function of the trigeminus. Some of these are already quite old and are cited by Kondracki in his thesis in 1872 (E. Kondracki: Ueber die Durchschneidung des Nervus trigeminus, Zürich), but although better than Snelling's they are unknown. He admitted the fact that after section of the trigeminus ulceration of the cornea and other changes of nutrition occurred in the eye. He took newly-born rabbits and caused adhesion of the lids by operation (artificial ankyloblepharon). When this was entirely healed he cut the trigeminus by the intracranial method. Opening the lids ten or fifteen days later he invariably obtained normal corneæ. Consequently he held the eye-lesions following section of N. v to be traumatic in origin. More recently (oral communication) von Gudden has operated by cutting the optic nerve behind the eyeball with the least possible injury to other parts within the orbit. In this operation the ciliary nerves are cut, and besides blindness there is anæsthesia of the cornea. But the lids retain their sensibility and by reflex action continue to protect the eye from injury and dirt; the cornea remains clear. Kondracki also refers to operations on peripheral nerve-trunks after which, by care and cleanliness, the skin of the foot remained free from the falsely so-called trophic changes. Gudden was not aware that long before Brown-Séquard had demonstrated facts like the last, showing ulcerations after nerve-sections to be traumatic.

sections show complete absence of trunk of nerve in the medulla, and total atrophy of the cell-group laterad of genu of facial nerve.

In the calf's brain above described, while the facial nerves and nuclei are well preserved, there is no trace of the fibres and nucleus of NN. vi. In neither case do any cells remain.

Consequently the origin of the abducens nerve is simple and direct.

5. N. vii. EXPT.—In the newly-born rabbit the facial nerve is extracted from the Fallopian canal. If the operation is well done a long piece of the nerve is brought away.

Results : Complete absence of extra- and intra-bulbar root of nerve on operated side ; the ventral aspect of the medulla is a little flattened. Sections show absence of root-fibres ; the site of genu is vacant, and no cells can be found in the so-called "lower nucleus," the three-grouped nucleus (rabbit) in the ventral aspect of the medulla. On the other hand, the nucleus under the genu of the nerve, near the floor of the fourth ventricle, is absolutely normal ; comparison with a normal nucleus shows that no cells are absent.

Consequently the facial nerve has only one nucleus—in opposition to the teaching of nearly all anatomists who have seen fibres of this nerve arise from the nucleus under its genu. Even so recent an authority as Spitzka[1] elaborately describes this double origin of N. vii.

In estimating the full value of this experiment, the result of operation upon N. vi must also be borne in mind: the two experiments mutually support one another, and their agreement (in a large number of experiments by Gudden and several of his pupils) renders an error extremely unlikely.

6. N. viii. As yet it has been impossible to complete an experiment upon this nerve, because of the severe rotatory movements and death by exhaustion which follow its section or extraction. Still, some important negative conclusions have been reached indirectly. First, it has no

[1] Contributions to Encephalic Anatomy, pp. 85–87, *Journal of Nervous and Mental Disease*, April, 1880.

connection with the so-called external auditory or Deiters' nucleus, for a proof of which statement see Monakow's experiment on corpus restiforme, p. 258; second, in Gudden's removal of one cerebellar hemisphere, the nerve and its nucleus were perfectly normal.

7. N. x.[1] Expt.—Extraction of central end of nerve and its ganglia in rabbits.

Results : Atrophy of well-known sub-ependymal nucleus, dorsolaterad of nucleus of hypoglossus. There is also complete atrophy of a group of large cells lying ventrad of intra-bulbar root of the nerve, and mediad of the so-called nucleus lateralis (which, as shown *supra*, is one of the origins of the corpus restiforme.) The tri-neural fasciculus (Spitzka's good name for the "*gemeinschaftliche aufsteigende Wurzel des seitlichen gemischten Systems*" of Meynert) is also decidedly atrophied on the operated side.

8. N. xi. A number of apparently successful extraction experiments have been made on this nerve, but the brains have not yet been cut.

9. N. xii.[2] Expt.—Extraction (extra-spinal) of the hypoglossal in a rabbit from five to eight days old.

Results : Complete atrophy of the cells of the sub-ependymal medial nucleus of hypoglossus, and absence of intra-bulbar rootlets. In the series of sections which I examined, there remained a few fibres and cells of the most caudal part of the nucleus, from a slight incompleteness in the operation. The ganglion cells dorsad of the atrophied nucleus, those of the opposite hypoglossal nucleus, and the olives, were perfectly normal.

Hence the origin of this nerve is simple and direct.

These results are very instructive. They show, in an apparently convincing manner, that nearly all the cranial nerves have a much simpler origin than most anatomists —especially those who allow physiological considerations to warp their observation—describe. Yet the one nerve which nearly all observers describe as having a simple direct origin—N. iii—is conclusively proved by most beautiful experiments to have a highly complex nucleus,

[1] Unpublished.

[2] *Idem*, but referred to briefly in several papers.

and to arise by both direct and crossed fibres. Even if we are not prepared to admit that these experiments of von Gudden absolutely settle the question of the origin of the cranial nerves, yet the results are sufficiently clear and constant, it seems to me, to merit the attention of anatomists, and to serve in some measure as a control upon the mere study of sections from normal nerve centres.

X.—Fasciculus longitudinalis posterior.

There are no experiments directly bearing upon this part, but from a consideration of some of the specimens above referred to and some others, important negative conclusions can be reached.

It is generally taught by anatomists that this fasciculus is directly connected with the nuclei of the motor cranial nerves, more especially those of NN. iii and iv, serving perhaps as a means of associating or coördinating their action. That this is not so, that it is an example of hypothetical anatomy, is shown by the following facts.

1. In sections exhibiting atrophy of NN. iii and iv, the fasc. long. post. are of equal and normal size, even when one is displaced somewhat, as in atrophy of the oculomotorius.

2. In the mole, whose entire optic apparatus, including NN. iii and iv, is undeveloped and as good as absent, there is a well-developed fasc. long. post.

XI.—Ganglion interpedunculare.[1]

This ganglion is a distinct external protuberance in rabbits, cats,[2] and dogs; in the monkey (Hapale), and in man it lies concealed in the wall of the foramen cœcum, but is

[1] Gudden: Mittheilungen über das Ganglion Interpedunculare.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

[2] This part is not named, figured, or indexed by Wilder, *op. cit.* "The ventral origin of the fasciculus Meynerti was jointly discovered by Gudden and Forel prior to 1872, but not by Gudden's method."

not to be confounded with the substantia perforata posterior. It consists mainly of small round or spindle-shaped ganglion cells, the smallest of which are very similar to "nuclei" of the neuroglia. It also contains some angular ganglion cells. The little nests described by Forel (Haubenregion, *Westphal's Archiv*, Bd. vii, p. 393) are really made up of most delicate amyelinic nerve fibres.

In horizontal sections of normal rabbit's brain, the G. I. lies caudad of the foramen cœcum, between the lemnisci (Schleife). From its frontal extremity issue the two fasciculi Meynerti, and laterad of these are cross-sections of bundles of N. iii, and longitudinal sections of the pedunculus corporis mammillaris (*vide infra*). A little frontad and quite laterad of the foramen cœcum are cross-sections of the tractus peduncularis transversus.

EXPT.—Removal of one ganglion habenulæ in a rabbit a few days old.

Results: Complete atrophy of corresponding fasciculus Meynerti, of its point of entrance into ganglion interpedunculare, and of the ganglion itself on both sides of the median line. No atrophy of cells observed. It is not stated whether fibres of origin of fasc. M. decussate or not in the ganglion, but from the illustration accompanying the article, it would seem that they did.

XII.—The corpus mammillare.[1]

Von Gudden describes the external appearance and general configuration of the C. M. in rabbits, cats, dogs, monkey (Hapale), and in man. Each animal presents some difference in external configuration of C. M. The rabbit presents lateral accessory eminences, which are the lateral ganglia.

Microscopic examinations (trans-sections), however, show that in all animals there are two sets of nuclei, a medial and a lateral on either side.

[1] Gudden: Beitrag zur Kentniss des Corpus Mammillare und der sogenannten Schenkel des Fornix.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

1. The lateral ganglion of C. M. It contains large ganglion walls. From its lateral part arises a fasciculus, the pedunculus corporis mammillaris. In the rabbit this fasciculus lies mediad of crus cerebri ; most N. iii fibres pass out through it. The ganglion interpedunculare and the beginning of fasciculus Meynerti lie mediad of the ped. corp. mam. It tends dorso-latero caudad to enter the pons Varolii. The columnæ fornicis lie mediad of it. It almost joins the lemniscus (Schleife), but can be distinguished from it by:

(*a*) Its larger-sized nerve fibres, which can be traced ventro-laterad of the lemniscus, through the trapezium, into the medulla oblongata, as far caudad as the olives.

(*b*) By any experiment which causes atrophy of the pyramidal tract (*vide* p. 238), such as removal of the frontal part of the brain, or of one hemisphere. On examining trans-sections from such a case, one can trace, caudad of the commissura anterior, atrophy of the fine fibre system of the lemniscus, as well as of the pyramidal tract proper on the side of the injury. The large fibres of the ped. corp. mam. ventro-laterad of the absent lemniscus, between it and the site of the pyramidal tract, are, however, preserved. In passing through the trapezium (never ventrad of it), it becomes more medial and approaches its fellow : in the trapezium the fibres are somewhat scattered, but caudad of it they once more unite to form a compact bundle lying dorsad of the pyramid (which is mostly made up of fine fibres). In the region of the olives the fasciculus tends more dorsad and is lost.

Conclusion : the lateral ganglion of C. M. is unconnected with the hemisphere.

2. Medial ganglion, made up of smaller cells. Two fasciculi arise from it, viz., the fasciculus Vicq D' Azyr (Meynert's radix ascendens of columna fornicis) and the fasciculus ad tegmentum (*Haubenbündel*).

(*a*) Fasciculus ad tegmentum. *Vide* special paragraph, p. 257.

(*b*) Fasciculus Vicq D' Azyr.

EXPT.—After removal of one hemisphere (rabbit) this fasciculus and the medial ganglion of C. M. undergo partial atrophy. Refers to illustrations by Cruveilhier, Van der Kolk, and other, of unsymmetrical (atrophied) human brains showing atrophy of one of the two eminences of the C. M.

EXPT.—Removal of one hemisphere and of the frontal part of the thalamus.

Results: Complete atrophy of fasc. Vicq D' Azyr and of the ventral part of medial nucleus of C. M.

Conclusion: The fasc. Vicq D' Azyr arises from the ventral part of the medial ganglion of C. M., and, extending dorso-frontad (in rabbit), is distributed to the nucleus anterior of the thalamus (tuberculum anterius). There it also enters into indirect connèction with fibres of the corona radiata, which extend to the cortex cerebri (to vicinity of motor area, according to Von Monakow's experiments—*vide infra*).

XIII.—Connections of the columnæ fornicis.[1]

EXPT.—Removal of one hemisphere and section or removal of both Ammon's horns.

Results: Trans-sections show complete atrophy (absence) of both columnæ fornicis; the fasciculus Vicq D' Azyr is reduced in size on the side of absent hemisphere.

EXPT.—Removal of one hemisphere without injury to cornu Ammonis.

Results: Columnæ fornicis normal; fasciculus Vicq D' Azyr somewhat reduced in size on operated side.

EXPT.—Incision of one hemisphere and section or laceration of fimbria on one side dorsad of commissura anterior.

Results: Disappearance of columnæ fornicis on operated side; very slight reduction in size of fasc. Vicq D' Azyr.

DR. GANSER'S EXPT.—After removal of one eyeball, a fine

[1] Beitrag zur Kenntniss des Corpus Mammillare und der sogenannten Schenkel des Fornix.—*Westphal's Archiv*, Bd. xi, Hft. 2, 1880.

forceps was introduced through the foramen opticum in the direction of the chiasm, with the intention of destroying the tractus opticus on one side. Besides this, however, a slight cut was made in the tuber cinereum which severed one columna fornicis.

Results : Complete atrophy of injured columna fornicis frontad of corpus mammillare ; caudad the atrophy could be traced behind the C. M. to the point where the col. fornicis decussates with its homologue (*vide* next section) to the side opposite the injury, in the central gray matter. The fasc. Vicq D' Azyr were normal.

These experiments show that the columnæ fornicis enter into the formation of (are continuous with) the fimbria, fornix, and cornu Ammonis.

They also prove in the most positive manner that there is no continuity between the columnæ fornicis and the fasciculi Vicq D' Azyr, and that these fasciculi do not form a genu or loop in or around the corpus mammillare, as claimed by Meynert.[1]

XIV.—Composition of the columnæ fornicis.

This is much more complex than is taught in works on nervous anatomy, and an approach to an exact solution has only been reached by von Gudden within the last year, after a study of many years, embracing the performance of numerous experiments.

To Ganser, his very able and ingenious collaborator, we owe the first and principal step in this series of discoveries, viz.: the experimental determination of the passage of the columna fornicis *through* the corpus mammillare (contrary to all previous writers, who taught that it arose from the C. M.), and of its origin further caudad and dorsad, in the central gray surrounding the third ventricle.

In 1880 [2] von Gudden published an article upon the corpus mammillare and columnæ fornicis, in which he claimed the demonstration of two additional fasciculi of the columna

[1] Stricker : "Manual of Histology," Am. ed., pp. 691–2, fig. 269. New York, 1872.

[2] *Op. cit.*

fornicis, besides the well-known bundle studied by Ganser. In the past year he has found still a fourth bundle in this system, but has not made the discovery public. Consequently, instead of giving an abstract of the paper of 1880, I shall give a *résumé* of what Prof. Gudden demonstrated to me, and of his explanations.

He now considers the so-called columna fornicis (*Fornixsäule*) consist of four fasciculi, viz.:

1. A ventral crossed fasciculus.
2. A dorsal " "
3. A dorsal direct fasciculus.
4. A ventral " "

1. The ventral crossed bundle is the one long known as the columna fornicis in its passage through the tuber cinereum to the corpus mammillare (Meynert's radix descendens fornicis). Its true origin and course were discovered by Ganser in 1878 by an experiment described on p. 252. The origin he found to be in the central gray near the third ventricle, but not from any distinct cell-group. In most animals these fibres of origin are scattered, and their course is difficult or even impossible to make out, but in rabbits (with a few individual exceptions), in mice, and moles the fibres are aggregated into considerable fasciculi, so that carmine, gold, and osmic preparations exhibit distinct pictures. As seen in the typical rabbit the fine bundles coming from the central gray run ventro-frontad; they are mediad of the fasciculi Meynerti. At a point caudad and dorsad of the medial ganglia of the corpus mammillare these fine bundles completely decussate; they now form a large fasciculus on either side, which curves around the medial ganglion of the C. M., passes frontad between it and the lateral ganglion. It apparently issues from the frontal aspect of the C. M. into the tuber cinereum, takes a direction dorso-latero-frontad to a level dorsad of the commissura anterior,

where it enters into the formation of the root of the fornix.

2. The dorsal crossed bundle joins No. 1 at a point frontad of the tuber cinereum. It is demonstrated by the previously cited experiment of removal of one hemisphere and of its cornu Ammonis without injury to the root of the fornix (region where columnæ fornicis enter fornix). In a series of trans-sections from such a brain, one sees, as stated *supra*, that fasciculus No. 1 is completely absent caudad of C. M. in it, and in the tuber cinereum; but in the sections frontad of this point, at the level of the commissura anterior, a bundle of transversly-cut nerve fibres is seen close to the site of the atrophied columna fornicis—just mediad of it. These fibres are pale; they have taken up much less carmine than those of the normal fasciculus No. 1 on the opposite side. Still further frontad, over the commissura anterior, these fibres diverge toward the median line, cross it, and enter the fornix of the opposite non-operated side. Indeed, without special preparation, after this experiment, by turning what remains of the fornix over frontad, it is easy to see with the naked eye a fasciculus passing from the normal half of the fornix ventrad toward the median line. In the sections it is also evident that this fasciculus (No. 2) is absent in the column opposite the injury, while its main bundle (No. 1) is present.

3. The dorsal direct bundle is made evident by Ganser's experiment of wound in the tuber cinereum p. 253. The inferior fasciculus (No. 1) is absent on one side in the sections, but dorsad of the commissura anterior there appears near the site of the absent bundle a round section of fibres. These can be traced caudad in the series of sections; it spreads latero-dorsad, describing a curve with convexity outward, to reach the dorso-lateral part of the thalamus, where it *seems* connected with a cell-group. It may, however, have an origin at a point further ventrad in the curve,

where there is a nest of larger cells. In this course the fibres of fasciculus No. 3 enter into the formation of the stratum zonale. As seen dorsad of the commissura anterior its fibres are smaller than those of fasciculi 1 and 2. After removal of one Ammon's horn it undergoes atrophy on the same side as the injury. If von Gudden were sure that this fasciculus (No. 3) ended in the above-mentioned cell-group in the thalamus, he would call it the *thalamic root of the fornix*, but he now prefers to call it the dorsal direct bundle.

4. The ventral direct bundle.[1] After Ganser's experiment in sections through the tuber cinereum, two or three little stained fasciculi (cross-cut) are seen to join the columna fornicis, or on the operated side to tend toward its site. Their ultimate course frontad is unknown, but it is certain that they undergo atrophy on the same side as the injury when the cornu Ammonis is removed on one side. Caudad the small bundles can be traced in a direction ventro-medio-dorsad into the central gray matter frontad of corpus mammillare : a distinct nucleus has not been observed.

Prof. v. Gudden believes that bundles 1 and 4 contribute to form that part of the fornix which lies under the corpus callosum and is known as the longitudinal fornix. Bundles 2 and 3 diverge and take a dorso-laterad course in the fornix.

The tænia thalamia crosses bundle No. 3, passes caudad of it without giving it any fibres. This is distinctly seen in such atrophy preparations as involve atrophy of the entire columna fornicis ; the cross-section of the tænia has the same diameter on either side. Neither have any of the preparations afforded evidence of a connection between the columna fornicis and the stria cornea.

[1] Unpublished.

XV.—Fasciculus ad tegmentum (*Haubenbündel*).[1]

This was partly described by Prof. von Gudden in his paper on the corpus mammillare (1880). He then correctly described its course, but its true origin, and more especially its termination in a distinct ganglion in the tegmentum, were not discovered until this year, and I have the privilege of first making the facts public.

Origin of the fasciculus. In sections from a rabbit which had undergone removal of one hemisphere together with the anterior part of the thalamus, the fasciculus Vicq D' Azyr is completely absent on the operated side, and the medial ganglion of the corpus mammillare to a great extent atrophied. However, one sees in the trans-sections, a fasciculus arising from the remains of the medial ganglion of the corpus mammillare; it extends a little way dorsad, then turns abruptly ventro-caudad to enter the tegmentum.

In a very successful (*i.e.*, in the right plane) horizontal section from a normal rabbit brain the horizontal course of the fasciculus can be traced a long way. In the frontal part of such a preparation are the commissura anterior and cross-sections of the columnæ fornicis; then, proceeding caudad, in the median line the slit-like opening of the third ventricle; on either side of this a large bundle is seen in cross-section, the fasciculus Vicq D' Azyr; from this a bundle of fibres diverges caudad, tending toward the median line; it passes mediad of another large bundle seen in cross-section, viz.: the fasciculus Meynerti; a little further caudad it lies mediad of the emerging roots (cross-cut) of N. iii, and finally is lost very near the median line, just ventrad of the fasciculus longitudinalis posterior.

The exact caudad connection (termination) of the fasc. ad tegmentum was ascertained by the following experiment.

[1] Unpublished.

By passing a very delicate knife vertically through the corpus callosum to the base of the brain, the chiasm and one medial ganglion of the corpus mammillare were divided. [Ganser's experiment of injury to medial ganglion by passing a forceps through the foramen opticum in a kitten also afforded a similar demonstration.] The study of trans-sections from these two cases showed the following results in parts caudad of the injured ganglion. There was no trace of the fasc. ad tegmentum on the side of the injury, and this atrophy could easily be traced as far back as a point a little caudad of N. iv, ventrad of the fasc. long. post. Then on the normal side is a beautiful well-defined cell-group, of which there is no trace on the side of the absent fasciculus. Both in the cat and rabbit the demonstration of this new ganglion was most conclusive.

Now that the terminal cell-group is known it is easy, in horizontal trans-sections from normal brains, to trace the fasc. ad tegmentum all the way from its origin to its termination.

Observing more closely the mode of origin of the (conjoined) fasc. ad tegmentum and the fasc. Vicq D' Azyr, by means of numerous series of sections, von Gudden has recently discovered that the medial ganglion of the corpus mammillare is composed of two distinct cell-groups or nuclei: a dorso-frontal nucleus which gives origin to the fasc. ad tegmentum, and a ventro-caudal mass from which springs the fasc. Vicq D' Azyr. This constitutes an addition to our knowledge of the corpus mammillare, as stated on p. 250.

I propose the term fasciculus ad tegmentum for the German noun *Haubenbündel.* This has Prof. Gudden's approval.

XVI.—Corpus restiforme and Deiters' nucleus.

Dr. C. von Monakow, assistant physician of the asylum of

St. Pirminsberg, in Pfäfers, near Rogatz, has carried on a number of most interesting researches by Gudden's method. He has more especially occupied himself with the cortex cerebri and basal ganglia, a field not specially entered upon by Gudden. He also made one experiment upon more peripheral parts,[1] which it is best to analyze immediately after Gudden's studies.

Dr. Monakow gives an historical account of Deiters' nucleus, or the so-called external acoustic nucleus.

EXPT.—In a newly-born rabbit, left hemi-section of the spinal cord, just below the decussation.

Physiological results: Complete left hemiplegia with nearly complete recovery later. At first little reaction to needle-pricks on both sides of body, but later was more marked (though incomplete) on the left side. State of face not specially stated.

Autopsy in six months.

Gross changes: Hemi-section not quite complete; a part, inner half, of fasciculus gracilis (Goll's column) and a small part of the anterior column remain. Evident ascending degeneration in medulla. Left side of cord smaller caudad of section. Left vermis superior cerebelli flatter.

Microscopic examination of sections as far frontad as thalamus.

(*a*) Changes frontad of injury: (1) Complete atrophy of fasciculus cuneatus and its nucleus; (2) partial atrophy of fasciculus gracilis and its nucleus; (3) complete atrophy of fasciculus ad cerebellum; (4) corpus restiforme reduced one half, atrophied chiefly in its medial part; (5) the atrophy of the nucleus of the fasc. cuneatus is by far more marked in its lateral mass, which can be traced to the caudal level of N. viii roots (the medial nucleus is reduced one third without evident histological changes); (6) the inner division of the processus ad medullam (or ascending N. viii of Roller) is but slightly altered—at level of true N. viii roots it is smaller on the operated side, because of absence of fibres coming to it horizontally from corpus restiforme; (7) at this level the large cells of Deiters' nucleus are nearly all lost on the same side as the injury, more especially in its latero-dorsal aspect—this atrophy blends with that of the adjacent corpus restiforme—the

[1] Monakow, Experimenteller Beitrag zur Kenntniss des Corpus Restiforme, des "ausseren Acusticuskerns," und deren Beziehungen zum Rückenmark.—*Westphal's Archiv*, Bd. xiv, Hft. 1.

acoustic root-fibres which apparently arise from this nucleus are seen perfectly intact in the wasted nucleus—all these roots are normal and equal on the two sides; (8) in the cerebellum the atrophy can be indistinctly traced into the vermis superior, whose cortex and medulla are certainly less developed than on the healthy side; (9) the left nucleus lateralis is almost wholly atrophied (*vide* ¶ vi, on origin of processus ad medullam); (10) the left formatio reticularis in its lateral part is generally reduced and poorer in cells, a condition which can be traced as far frontad as the lobus opticus; (11) the pyramid opposite the injury is slightly smaller, but after a short distance frontad this atrophy ceases; (12) the prolongation of the lemniscus (*Schleif*) in the medulla is slightly atrophied on the same side as the injury. No changes in lobi optici or beyond; these were particularly searched for, as Monakow's principal idea in making the experiment was to trace an ascending atrophy to the brain.

(*b*) Changes caudad of the injury: Complete atrophy of pyramid below hemi-section, on same side of course.

The perfectly normal parts of medulla are the medial part of formatio reticularis, the fasc. long. post. (continuation of anterior column ?), the upper olives, and all the nerve nuclei and roots. The lower olive on the operated side is a trifle smaller on the operated side, and the same is true of the ascending root of N. v, but the word atrophy can hardly be applied.

Conclusions: 1. That the processus ad medullam (*vide* ¶ vi) is made up of several bundles: of the processus ad cerebellum (*Kleinhirnseitenstrangbahn*), fibræ arcuatæ, fibres from both olives and the formatio reticularis, and largely in its medial portion of fibres derived from the fasciculus cuneatus through its lateral nucleus.

2. This last portion of the atrophied corpus restiforme can be traced to a connection with the large cells of Deiters' nucleus.

3. Deiters' nucleus is certainly not connected with the acoustic nerve.

4. The atrophic fasciculus ad cerebellum is in relation with the caudal part of the vermis superior (compare p. 239, on connection of processus ad cerebrum, with frontal part of vermis, as shown by Forel).

The most important result of this experiment is that concerning the relations of Deiters' nucleus. With singular unanimity it is considered by anatomists as the outer acoustic nucleus, because they have traced root-fibres of N. viii into it. So recent an authority as Spitzka[1] not only admits it as a nucleus of N. viii, but declines to consider the usual division into an internal and external nucleus. If any anatomist could see, as I have seen, the N. viii fibres absolutely normal in the area of Deiters' nucleus while almost all the cells were absent, he would begin to reflect on the uncertainty of the simple study of normal sections, however carefully or conscientiously carried out. The annals of encephalic anatomy are replete with the errors due to exclusive devotion to the Rolando-Stilling method, and it is high time that its delusive teachings be corrected by the other special methods of research.

XVII.—Relation of cortex cerebri to adjacent parts.

The most important researches of Dr. von Monakow, those which are in all respects his own, and which, if confirmed, will add greatly to our comprehension of cerebral architecture and physiology, are those upon the relations between cortical areas and portions of the thalamus, the corpora geniculata, and the lobus opticus. A portion of his experiments have already appeared in print,[2] and two other contributions were made this year to the German and the Swiss Science Congresses respectively. He was led to undertake these researches partly by Munk's physiological experiments, and partly by the fact, noted several times by Gudden, that after removal of one hemisphere in the rabbit,

[1] "Contributions to Encephalic Anatomy," chapter i, appendix note 42.—*Journal of Nervous and Mental Disease*, April, 1880.

[2] Ueber einige durch Extirpation circumscriptar Hirnrindenregionen bedingte Entwickelungshemmungen des Kaninchengehirns.—*Arch. f. Psychiatrie*, Bd. xii, Heft 1.

Weitere Mittheilungen über durch Extirpation circumscriptar Hirnrindenregion bedingte Entwickelungshemmungen des Kaninchen.—*Idem*, Heft 3.

the thalamus of the same side was smaller. He also admits that Luys has for some time taught that definite regions of the cortex stood in relation to definite portions or nuclei of the thalamus, but this from pure theory.

After a few experiments on kittens, he was obliged, because of great mortality, to use rabbits, which he did with regret, because of their slight intelligence (compare Gudden and Ganser, whose rabbits seemed normal after removal of one hemisphere).

Expt. 1.—A portion of cortex and white substance of right hemisphere was removed from the parietal gyrus near the longitudinal fissure. This region M. considers to be just caudad of Ferrier's and Fürstner's area No. 6 (see fig. 1) ; about equivalent to Hitzig's No. 1 area in dogs and monkeys ; and also to Munk's centre for the leg. Caudad and laterad of extirpated region are Munk's region for the sensibility of the eye, and further his visual sphere. The extirpated zone is marked *a* in fig. 1.

Results : The nucleus externus of right thalamus is totally atrophied. Right corpus geniculatum laterale much atrophied, chiefly in its caudal portion. Right trapezium, pyramid, and lateral lemniscus a little smaller than their homologues. A part of the internal capsule in relation with the wound is atrophied. The lateral part of the crus cerebri is small, and the formatio reticularis reduced.

Expt. 2.—Removal of a portion of left occipital lobe (A. in fig. 1). Considers spot injured as equivalent to Ferrier's and Fürstner's centre No. 9, and to Munk's area A, the visual sphere of the dog.

Results : Slight atrophy of medullary substance near cicatrix, of caudal part of left internal capsule ; great atrophy of left corpus geniculatum laterale and of tractus opticus, of left tractus peduncularis transversus, of the outer part of the nucleus externus of the thalamus. The left lobus opticus is slightly flattened ; the right optic nerve a little smaller than its fellow.

Conclusions: The atrophy extended from the visual sphere to the corpus geniculatum laterale and slightly to the rest of the optic apparatus ; it was in inverse degree to what follows enucleation of the eyeball. The corpus geniculatum laterale is, therefore, a centre for vision in

association with the cortical centre; the outer part of the nucleus externus which the author considers equivalent to the pulvinar,[1] is also a part of the optic apparatus.

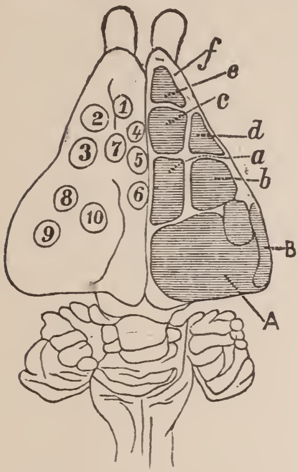

FIG. 1.[2]

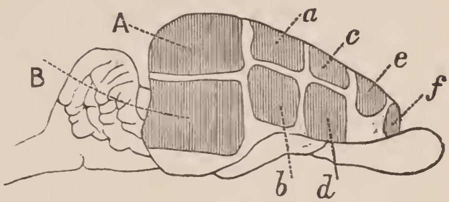

FIG. 2.[2]

The second article contains the following numerous experiments:

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[1] Forel has shown that the lower mammals have no true pulvinar.

Monakow adds some remarks on the nomenclature of the nuclei of the thalamus, and follows Ganser's (Gehirn der Maulwurfs, *Morphol. Jahrbuch*, Bd. vii, p. 711) arrangement, into nucleus anterior (tuberculum anterius), nucleus internus, nucleus externus, and nucleus posterior.

[2] Explanation of cuts in the original articles.

Fig. 1.—Right hemisphere slightly modified from Monakow.

A. Zone of corp. gen. ext.
B. Zone of corp. gen. int.
a. Zone of optic thalamus.
b. Zone of stratum reticulare.
d. Zone d.
e and *f.* Zone of nucleus internus.

On the left hemisphere are placed the motor centres of Ferrier, as depicted in Fürstner's article, *Westphal's Archiv*, vol. vi, p. 725.

1. Raising of upper lip; rotation of head to right.
2. Drawing of mouth to right; masticatory movements on right; drawing of head to right.
3. The same.
4. Raising the right shoulder; extending the toes.
5. Retraction and adduction of the right paw; extension of toes.
6. Epileptic seizure.
7. Masticatory movements with the right upper lip and jaws; drawing of the head toward the left.
8. Shutting the eyes.
9. The same.
10. Indefinite.

Fig. 2.—Profile view of right hemisphere of figure 1.

Expt. 1.—Removal of zone *b*, fig. 1. Results : Atrophy of part of internal capsule (its third fifth about), extending from the wound centrally ; of nervous tissue laterad of the nucleus anterior of the thalamus (not atrophied). A slight atrophy of the corpus geniculatum laterale M. thinks is due to encroachment of lesion upon zone A. The lateral part of the crus cerebri is slightly reduced in size. Considers the part most atrophied in this experiment, the lateral adjunct to the nucleus anterius as the stratum reticulare (frontal part of *Gitterschicht*). Zone *b* is therefore the centre for the stratum reticulare.

Expt. 2.—Extirpation of zone B. This area occupies the greater part of the temporal lobe, and corresponds with Munk's auditory sphere B in dogs and monkeys. Results : Atrophy of connected fasciculus of corona radiata and internal capsule (caudo-ventral part), and of the corpus geniculatum mediale. There is also slight atrophy of the caudal part of the stratum reticulare (*Gitterschicht*). No changes could be detected in the acoustic nerve and its nucleus.

Conclusion : Zone B is the centre for the corpus geniculatum mediale. Query : Is the corp. gen. med. a primary centre for hearing as the corp. gen. lat. is for vision ?

Expt. 3.—Extirpation of extreme frontal end of hemisphere *f* and a part of *e* in fig. 1. Results : Atrophy of basal part of capsula interna, without and within the corpus striatum, and of a part of the nucleus internus. Corpus striatum preserved. Pyramidal tract partly atrophied.

Expt. 4.—Removal of zone *d*, including some of *b*. Results : Atrophy of corresponding part of internal capsule, and of caudal part of stratum reticulare.

Expt. 5.—Extirpation of area including *c*, *d*, *e*. These zones are frontad of *a* and *b*, and include nearly all the motor centres of Ferrier and Fürstner : its medial part corresponds to the paracentral lobule. Results : Atrophy of dependent fasciculi of internal capsule, without and within the corpus striatum (which is normal) ; atrophy of tuberculum anterius (nucleus anterius) to one half its normal size, an atrophy equally distributed in its two cell-groups. Thence the atrophy can be followed in two paths, separated by normal fibres coming from other parts of the brain : (*a*) The ventral atrophy involves the pyramidal tract (medial part of crus cerebri) ; the corresponding pyramid is al-

most totally atrophied, and the opposite half of the spinal cord contains the well-known crossed pyramidal atrophy. The corpus Luysii and the substantia nigra on the side of the injury are reduced in volume. (*b*) The dorsal atrophy expands into the area made up partly by the stratum reticulare, and by the laminæ medullares ext. The nucleus internus is slightly atrophied. The fasciculus Vicq D' Azyr is small, but not reduced in a degree corresponding with the atrophy of the nucleus anterius, Still another atrophy is produced by this operation, viz.: that of a longitudinal fasciculus in the white substance of the hemisphere, in its dorsal part, extending to the occipital lobe (fasciculus longitudinalis superior). Areas *c*, *e*, *f* constitute a pyramidal zone.

Monakow also extirpated five smaller areas in A, and separately the areas *c*, *d*, *e*. The results agreed with those obtained by experiments detailed above. Altogether more than fifty experiments were made.

Summary: If we associated the cortical zones with those central nuclei which were most atrophied by their extirpation, we have the following list:

Zone A, or visual sphere, is related to the corpus geniculatum laterale.

Zone *a* is related to the nucleus externus.

Zone *b* is related to the stratum reticulare.

Zone B is related to the corpus geniculatum mediale.

Zones *c*, *d*, *e* are related to the nucleus anterior and nucleus internus.

Zones *c*, *e*, *f* are related to the pyramidal tract.

It is observable that the nucleus posterior does not suffer in any of these experiments: very probably it is connected with strictly basal parts of the cortex.

Monakow believes, in consequence of these experiments, that each cortical area or zone is connected with more than one path or tract.

That the various nuclei of the thalamus as well as the corpora geniculata stand in definite relations to circumscribed cortical areas.

That the corpora geniculata medialis et lateralis are ana-

logues of the nuclei of the thalamus and should be considered as associated with them.

XVIII.—Connections of the cortical visual area with the optic apparatus.

EXPT.[1] I.—In a newly-born kitten removal of a large part of the parietal cortex and the subjacent white substance on one side. Autopsy in six months. Results: Sections frontad of wound show great atrophy of cortex of motor gyri and of the underlying white substance on the same side as the injury. Microscopic examination shows that the atrophy bears chiefly upon the third layer of cells in the cortex, that containing the larger ganglion cells (giant-cells of Betz); these are entirely absent. Section in the injured region; the corpus striatum is normal, but the fasciculi of the internal capsule which normally traverse it are absent,[2] except the ventral bundle derived from the lobus olfactorius. The optic nerve of the same side is smaller (its transverse diameter is less) than its fellow; this being due, in Monakow's opinion, to absence (atrophy) of the fasciculus lateralis, which has a connection with the cortical visual area (encroached upon by the wound). Further caudad the tractus opticus is smaller on the operated side; the tuberculum anterius (nucleus anterior) of the thalamus is wholly atrophied. The commissura anterior and the temporal lobe are normal. The nucleus externus thalami is almost wholly atrophied, while the nucleus internus is preserved. The part dorsad of the corpus geniculatum lat., which M. holds to be the equivalent of the human pulvinar, is fairly preserved. The corp. genic. lat. itself is somewhat reduced, but the mediale is normal. The lobus opticus on the injured side is smaller than its fellow, having suffered atrophy in its middle medullary layer. The medial part of the crus cerebri is much atrophied, and the lemniscus less developed on the injured side. The fasc. Vicq d'Azyr and medial ganglion of the corpus mammillare are partly atrophied. In the tegmentum there is absence of the pyramidal tract and diminution of the lemniscus. In the caudal part of the pons there is no pyramid on the side of injury, but the slight atrophy of the lemniscus gradually ceases.

[1] Experimentelle Untersuchungen über umschriebene Hirnrindenatrophien. Vortrag gehalten an der 56 Versammlung Deutscher Naturforscher und Aerzte. Freiburg, Sept., 1883.

[2] Von Gudden obtained a similar result in his experiment of removal of the motor gyri, *vide* p. 238.

EXPT.[1] 2.—In a newly-born rabbit, a simple oblique stabbing wound was made with a narrow knife in the temporal lobe, in a medio-ventrad direction. Autopsy in three and a half weeks. It was found that the caudal part of the internal capsule (Gratiolet's optic fasciculus), its connection with the corpus geniculatum mediale, and the tractus opticus, had been divided; the crus cerebri very slightly injured.

Results: Sections through the brain frontad of the injury showed the cortex normal, but its internal capsule less developed; caudad of the injury, in the occipital lobe there is marked atrophy of the cortex and white substance, due to section of the internal capsule. There is complete atrophy of the corpus geniculatum laterale (greater than can be accounted for by section of the tractus opticus). The lobus opticus on the same side as the injury is distinctly smaller. The corp genic. mediale is completely atrophied from section of the fibres connecting it with the internal capsule. The various nuclei of the thalamus are normal. Microscopic examination of the atrophied occipital cortex showed that the atrophy affected mainly the third layer, or layer of large ganglion cells; they were entirely absent. The cells of the fifth layer were slightly reduced. In the small lobus opticus it is seen that the atrophy bears chiefly upon the superficial medullary layer, whose cells are fewer and smaller. After removal of the visual area alone (B in fig. 1), the atrophy of the lobus opticus is not of these cells, but is most marked in the middle medullary layer. In the above-detailed experiment there is also some atrophy of this layer, because a part of the optic fasciculus going to the cortex was injured. The atrophy of the superficial medullary layer is, however, much greater than after enucleation of one eyeball.

The results of these experiments, Monakow's first and second set of experiments upon the relations of the cortex and the thalamic nuclei (including the corpora geniculata).

What is more important, and what, if confirmed, will form an epoch in this department of experimental physiology, is the production of an ascending (centripetal) atrophy of the cortex by section of fasciculi of the internal

[1] Ueber die Ursprungscentren des Nervus Opticus, und deren Beziehungen zur Grosshirnrinde. Vortrag gehalten an der 66 Versammlung der Schweizerischen Naturforschenden Gesellschaft, Zürich, August, 1883.

capsule. It will be remembered that both Gudden and Monakow (see corpus restiforme) have shown that after section of the pyramidal tract low down (caudad) there was no ascending (centripetal) degeneration, or at most only in a very slight degree for a millimetre or two. But in both the last experiments section of the internal capsule (in expt. 1 its frontal division, in expt. 2 its occipital division) caused distinct atrophy of the associated cortical regions, in which mainly the third cell-layer (that of giant-cells) was atrophied.

The first experiment also corroborates Gudden's finding, that the corpus striatum has no corona radiata.

Another important result (of expt. 1) is the apparent demonstration that there is a degree of anatomical continuity between the cortical visual area and the optic *nerve* (its fasciculus lateralis). This is in opposition to von Gudden's results.

The general agreement between the results of physiologists (Munk, Hitzig, Ferrier, and others) and those of von Monakow is striking, and affords supplementary evidence of their approximate exactness.

Dr. von Monakow has recently made an autopsy of a human case [1] which strongly supports his and Munk's experiments on the visual cortical area.

There was in this case an old (probably five years old, judging by the imperfect history of the case) yellow patch (softening due to blockade of branches of the right posterior cerebral artery) in the right occipital lobe, more especially destroying the cuneus. Previous to the patient's reception in the asylum he had had "imperfect vision," which was explained by finding homonymous hemianopsia. In sections, one can trace, in the clearest manner, a band of degeneration from the patch in the occipital division of the internal capsule (Gratiolet's optic fasciculus) frontad and mediad to the corpus geniculatum laterale and pulvinar. The pulvinar is al-

[1] Unpublished.

most entirely atrophied, and the corp. genic. lat. largely so ; its folds are absent. The crus of the lobus opticus (brachium) is also in a state of secondary degeneration (granular cells, excessive staining by carmine). These changes border closely on the corp. genic. mediale which is normal, a fact which speaks positively against a primary disease here (besides the blood-vessels of this region were healthy). The lobi optici are equal and present no changes to the naked eye, but microscopic examination shows that in the right lobus the middle medullary layer (*mittleres Mark* of Ganser) contains fewer and smaller cross-cut bundles of nerve fibres. The atrophy is about the same as in Ganser's rat B (*vide* p. 142 of ARCHIVES for October). The lateral and medial parts of the lemniscus are smaller on the side of the lesion. It should be stated that further frontad the lateral part of the corp. genic. lat. is completely atrophied, while its medial part is preserved ; von Monakow is disposed to conclude that the former is connected with the cuneus, while the latter receives its innervation from the rest of the visual cortical area.

The tractus opticus on the side of the lesion is much reduced in size. Beyond the chiasm, the atrophy is traceable in both optic nerves ; the degenerated part standing out clearly marked by an excess of carmine. The right optic nerve exhibits a patch of degeneration in its lateral aspect (fasciculus lateralis ; the left nerve, in its medial aspect (fasciculus cruciatus).

XIX.—Connections of the optic nerve with the "primary optic centres."[1]

EXPT. 1.—In a newly-born rabbit, one eyeball was enucleated. Autopsy after one year. Results : Complete atrophy of injured optic nerve ; atrophy of tractus opticus on the opposite side of its fibres overlying the corp. geniculatum lat. Also atrophy of this nucleus, more especially in its lateral part. Microscopic examination shows that this atrophy affects the fundamental or intercellular substance, and that the peculiar globular cells are about as on the normal side, only very much closer together. The lobus opticus is somewhat smaller on the side opposite the injury, and microscopic examination shows that the atrophy involves both cells and fibres in the superficial medullary layer (*oberflächliches Mark* of Ganser). No change in the cortex cerebri. In considering this experiment it should be borne in mind that in the rabbit the optic nerves almost totally decussate.

[1] Unpublished.

Expt. 2.—In a newly-born kitten, one eyeball was enucleated. Autopsy in three months. Results : Complete atrophy of injured optic nerve ; both tractus optici are smaller than normal, the one opposite the lesion a little flatter than its fellow. [The optic decussation in cats is considered by M. to be nearly equal.] Both corpora genic. lat. are smaller, as are also the adjacent regions equivalent to the pulvinar. The streaks normally present in the corp. genic. lat. are absent, and the lateral aspects of the pulvinars exhibit an atrophic indentation. The lobi optici are about equally reduced in size, and microscopic examination shows the atrophy to bear chiefly upon the superficial medullary layer (Ganser's *oberflächliches Mark*), mostly in its fibres, but also somewhat in its ganglion cells.

I cannot close this review without expressing my appreciation of the courtesy with which Doctor von Monakow received me at St. Pirminsberg, and the pains he took to demonstrate all his preparations. He, as well as Professor von Gudden, have allowed me to make use of unpublished material, and its appearance in the Archives of Medicine is to be considered as preliminary original communications from these gentlemen.

ON DYSPNŒA.*

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AMONG the many groups of symptoms which come under the observation of the practical physician, none is more important than that by means of which the condition of dyspnœa is made manifest.

Dyspnœa is an embarrassment of the function of respiration. It is imperfect oxygenation of the hæmoglobin. The symptoms which indicate its presence are, subjectively, the sensation of suffocation, and, objectively, the appearances produced by increased respiratory effort, carbonic-acid poisoning, and increased venosity of the blood. In order to properly appreciate the causes of dyspnœa it will be necessary to consider, first, the factors concerned in the carrying on of normal respiration. These are: first, the lungs; second, the upper air-passages, through which the atmosphere is admitted to contact with the pulmonary tissue; third, the thoracic walls, through whose movements the entrance and exit of air are conditioned; fourth, the pleural membranes; fifth, the muscles which act upon the thoracic walls; sixth, the nervous mechanism; seventh, the circulatory apparatus; eighth, the conditions of the surrounding media. The part played by these factors is suf-

* One of a course of lectures on Symptomatology, delivered before the Chi Phi Delta Fraternity, at the Long Island College Hospital.

ficiently well understood, and I will not take the time to consider them in detail.

It may be useful, however, with the object of preparing our minds for the consideration of the main topic of the evening, to review the normal course of the respiratory function.

In the depths of the oblong medulla, just above the point of the calamus scriptorius, is a ganglionic station whose function it is to regulate the contractions of the respiratory muscles. It is known to physiologists as the *respiratory centre.* We cannot take the time to trace the history of its evolution, even were I competent to the performance of so difficult a task; but must begin with the fact that, in the development of the embryo, this, like other organs, which will only come into service later in life, attains its proper growth.

During fœtal life the blood is thoroughly aërated through the placental circulation; but when this is cut off, by the expulsion of the child from the body of its mother, the lack of oxygen is quickly felt at this central station, and discharges occur, which, being transmitted along the efferent nerves, liberate the force of the muscles of respiration. With the expansion of the thorax, important phenomena occur, viz.: the separation of the walls of the cavity opens not only the bronchioles and air-sacs, but the pulmonary vessels also, drawing the blood from the pulmonary artery off into the lungs. By this means the pressure in the ductus arteriosus is diminished, the aortic and pulmonic currents are balanced, and as the current of blood through it has ceased, no obstacle is offered to the contractility of that vessel. The latter, accordingly, contracts, and its calibre is diminished, and finally obliterated. At the same time, the quantity of blood discharged by the pulmonary veins into the left auricle is increased sufficiently to distend

it and arrest the passage of venous blood into it through the foramen ovale. That foramen has muscular boundaries, which contract under the diminished pressure and, finally, close it. Then, the venous blood all passes into the right ventricle, thence into the pulmonary artery, and is poured into the capillary net-work of the parenchyma of the lung, where its contact with the atmospheric air permits of its proper oxygenation.

If we return to the respiratory centre, and examine its anatomical relations, we shall find that it is, truly, the central station for respiratory impulses. The connections of its ganglion cells are as follows: Issuing from the sides of the medulla, above are the facial nerves of either side; below these are the glosso-pharyngeal nerves. These two supply efferent or motor fibres to the nostrils, mouth, soft palate, and pharynx. Then come the pneumogastrics, which form pharyngeal plexuses with the two preceding nerves, and give fibres to the larynx, trachea, bronchi, and pulmonary parenchyma. Below the vagi, the spinal accessories emerge, and innervate the superior muscles of inspiration. After these, the phrenics pursue their course downward, through the mediastinal space, to the diaphragm. Still lower down the other spinal nerves supply those muscles of the thorax and abdomen, which are concerned in the respiratory process; they convey motor impulses to the intercostal and other muscles of the trunk. The anatomical connection of the nerves last mentioned with the respiratory centre has not been demonstrated, but their communication, direct or indirect, is rendered indubitable by the phenomena of respiration. Indeed, it would seem, from the constant and immediate physiological relation between the intercostal muscles and the medulla, that there must be fibres which pass directly and without interruption from one to the other. Other phenomena, particularly the

effects of psychical disturbances upon the respiratory acts, render it certain that there are connections higher up, with the cerebrum.

Under the influence of the diminished amount of oxygen in the hæmoglobin, which occurs, in normal breathing, eighteen to twenty times per minute, moderate discharges occur, which pass out on the fibres most directly connected with the ganglion cells of the respiratory centre, viz., the pneumogastric, spinal accessory, phrenic, and intercostal nerves. If the amount of oxygen be still further diminished, the discharges are more violent, and overflow into the more remote channels, the facial above, and the nerves supplying the dorsal and abdominal muscles below. The alæ nasi are then seen to dilate with the inspiratory acts, the mouth is held open, and the heaving of the chest and abdomen is increased. This gives us the picture of "labored breathing." If the diminution of oxygen is carried still further, violent contractions of the entire muscular system may be produced.

An interesting and, as we shall see when I come, in a future paper, to treat of cough as a symptom of disease, an instructive fact, in connection with these more intense excitations of the centre, has been observed by the physiologists. It has been found that, when the deprivation of oxygen has been carried to an extreme degree, the muscles of *expiration* are those most violently contracted, so that the convulsions which ensue fix the chest in the position of expiration. The accumulation of carbonic acid seems to have less effect upon the respiratory centre than upon the cerebral cells above, upon which its action is that of a narcotic poison.

After this hasty review of some of the data of the anatomy and physiology of respiration, let us pass to the study of the clinical features of diminished oxygenation, or dyspnœa.

Any one of the factors concerned in the normal breathing may, by its derangement, become a source of disturbance. Thus, it is quite evident that any abnormal condition of the lung itself will interfere with its äerating function. Many of the diseased conditions of the upper air-passages, by offering obstruction to the free ebb and flow of the aërial tides, cause dyspnœa, sometimes to an intense and even fatal degree.

Fixation of the chest-walls is equivalent in its effects to stenosis of the air-tubes, though the dyspnœa from this cause does not often reach as high a grade, because the lower thoracic wall, the diaphragm, seldom loses its mobility completely at the same time that the ribs become stationary.

Diseased conditions of the pleural membranes are frequent causes of embarrassment of respiration. Adhesions of the surfaces will interfere with the changes of position by which the lungs accommodate their shape to that of the cavity in which they are enclosed; while accumulations of fluid, or other matters, in one or both pleural cavities, may interfere by direct compression, or, more correctly, by interfering with expansion. As for the circulation of blood through the lungs, the ways in which it may be obstructed are very numerous. Another condition, which frequently gives rise to dyspnœa, and which may be included under this head, is an altered condition of the blood itself; and that alteration may be either quantitative or qualitative. Diminished or spasmodic action of the respiratory muscles is sometimes seen: the first, in cases of great muscular weakness or degeneration; the second, in tetanic and other spasms,—for instance, in epileptic convulsions. These might, more properly, be classed in the next division.

Morbid conditions of the nervous mechanism of respiration are observed in such functional derangements as epilepsy, infantile convulsions, puerperal eclampsia, tetanus, spasm

of the adductor muscles of the vocal cords, and, again, in paralytic affections—such as paraplegia from injuries to the vertebræ, direct pressure of tumors upon the upper portion of the cord or on the medulla; degeneration of the ganglion cells of the medulla in diphtheritic paralysis; bulbar paralysis, locomotor ataxia, and the general paralysis of the insane. The direct pressure of aneurisms and tumors may also produce paralysis of the muscles of respiration. A very important paralysis, and one frequently overlooked by the general practitioner, is that of the abductor muscles of the vocal cords. In such a case, the opening of the chink of the glottis, which normally occurs with each inspiration, cannot be accomplished, and the consequent obstruction to the entrance of air may be so great as to cause asphyxia. Further, it is possible—nay, probable—that in injuries to the cerebral cortex and other portions of the upper brain, inhibitory influences are generated which impede, or even suspend, the action of the *respiratory centre*. I think that a close observation, *ante* and *post mortem*, of the head injuries shown you in the surgical wards, will impress upon your minds the truth of this statement. That the conditions of the surrounding media, viz., the atmospheric air, influence respiration, needs no elucidation here.

The question of the presence of dyspnœa, and its cause, will frequently come up in the examination of patients.

It is spoken of as *constant*, or as *dyspnœa on exertion*. In other words, it may be constantly present,—whether the person is lying down, sitting, standing, or walking; or it may only occur on the occasion of the patient's making exertion; though perfectly comfortable during our examination, he will tell us that, upon the taking of exercise, he feels short of breath. In its milder degrees, this latter form of dyspnœa only develops when some quite vigorous movement is made—such as running, walking uphill, or ascend-

ing a flight of stairs. In a more aggravated form, it will be felt even on walking moderately fast.

Dyspnœa upon exertion is present, first, in simple anæmia, and is due to the relative or absolute diminution in the number of the red blood corpuscles. These bodies may carry sufficient hæmoglobin to procure oxygen enough from the air for the ordinary nutrition of the tissues, when the body is at rest but, when the muscles are contracting actively, and increased oxidation occurs, the oxygen is extracted from the blood more rapidly than it can be taken up from the atmosphere, and dyspnœa is the result.

Simple bronchitis produces dyspnœa on exertion, through the narrowing of the tubes, resulting from the tumefaction of their mucous coats. This slight narrowing does not prevent the ingress of sufficient air to oxidize the hæmoglobin when the body is at rest; but, if the internal oxidation is increased for the production of muscular power, the difficulty of inspiration is immediately felt.

In *pulmonary emphysema*, still another form of impediment is met with, whose deleterious effects are felt on exertion.

Owing to the dilatation of the lungs, which cannot be entirely overcome by the muscles of expiration, the difference between expansion and contraction of the thorax is greatly diminished, so that the increased respiratory movements, necessary to the solicitation of a greater quantity of air into the chest, cannot be produced. In addition to this, the atrophy of the alveolar walls and their capillaries, characteristic of this disease, reduces the extent of aërating surface, so that, while there is enough for the requirements of quiet respiration, there is no reserve to meet the increased demands of the muscles during active movement.

Still another cause of this form of dyspnœa is found in the derangements of the pulmonary circulation, due to cardiac

and other vascular diseases. The condition of the lungs and air-passages may be favorable, but the disabled heart can only circulate the blood through them when the body is quiescent. Under the influence of exercise, the increased delivery of venous blood into the right side of the heart causes the presence of such an amount of that fluid in its cavities that it is unable to propel it rapidly enough through the pulmonary veins, obstructed as these are, for example, by a contracted mitral orifice. The blood accumulates in the great veins, and the arteries do not contain enough for the wants of the respiratory centre, which, consequently, discharges rapid and forcible motor impulses to the respiratory muscles, and, as we say, the person pants for breath.

Other less frequent causes of shortness of breath upon exertion might be mentioned, but I shall allude to only one of them. We should never forget that a slight or, in some cases, quite a considerable amount of fluid may be present in a pleural cavity, and yet produce no dyspnœa, when the patient is resting at home, or sitting quietly in the physician's office. Many such cases are overlooked, because we are too prone to neglect the examination of the base of the thorax, unless there are other well-marked symptoms calling our attention to the probable existence of a pneumonia or pleurisy.

If a patient complains of this form of dyspnœa, and no bronchitis, emphysema, or cardiac disease is detected by examining the chest anteriorly, we should never fail to carry our investigation to the posterior and dependent portions of the chest. Neglect of this precaution has been to the serious disadvantage of many a patient, and brought discredit on many a physician, for there is a latent form of pleurisy, unaccompanied by lancinating pain or fever, but resulting, like the more acute forms, in serous effusion.

When dyspnœa is *constant*, it is usually due either to an aggravated stage of one of the diseases already mentioned, or to one of the following: acute pleurisy, acute pneumonia, pericarditis with effusion, phthisis, peribronchitis, chronic interstitial pneumonia with or without bronchiectasis, fibrinous bronchitis, or laryngeal stenosis. The mechanism of all these conditions is readily understood. An exaggerated condition of this form of dyspnœa is known as orthopnœa. The sense of suffocation becomes so great when the patient assumes the recumbent position, that he is compelled to sit upright, or be bolstered up in bed. Orthopnœa is a frequent accompaniment of acute inflammatory diseases of the pulmonary parenchyma, pleura, and pericardium. It almost invariably accompanies extensive pulmonary œdema. In pericarditis and advanced cardiac disease, the erect posture favors the retention of the venous blood in the veins of the abdomen and lower extremities through the operation of the law of gravitation. This diminishes the accumulation in the right heart, and makes it work easier, because the portal vein and its tributaries are capable of containing all the blood in the body, particularly of an anæmic patient. In pleurisy with effusion, raising the shoulders allows the fluid to gravitate to the lower portion of the chest, and gives the upper portions of the lungs freedom of expansion and contraction. In pneumonia and pulmonary œdema, the same law is brought to bear upon the fluid secretions in the bronchial tubes.

There is a variety of orthopnœa which is apparently due to disturbed nervous influence, but its pathology is obscure, and we have not time to enter upon the discussion of it. Asthma usually causes marked orthopnœa, as I shall describe further on.

Besides the dyspnœa which is constant, and that which

only appears upon exertion, there is a third form, characterized by its occurring in paroxysms, *spasmodic dyspnœa.* In this variety there are intervals of either perfect or relative freedom from shortness of breath, alternating with attacks of dyspnœa, which is frequently urgent, and sometimes fatal.

The diseases characterized by paroxysmal dyspnœa are spasmodic croup; spasm of the laryngeal adductors from other causes; spasmodic asthma; thymic asthma; angina pectoris; aortic aneurism, and tumors compressing the pneumogastric nerves; chronic Bright's disease. It is, of course, impossible, in the short space of this lecture, to enter into a study of the pathology of these various diseases, but the essential feature of these cases is the presence of an aberrant nervous influence, operating in different ways. In spasmodic croup, the highly erethetic nervous mechanism of childhood is excited by an irritation originating in the laryngeal mucous membrane, and eventuating in a contraction of the adductor muscles of the vocal cords, by which the glottis is closed during inspiration, when it should be open. Spasmodic asthma has its peculiar lesion located farther down the tubes, which are narrowed, either from swelling of the mucous membrane, spasm of the circular muscular fibres, or both. Thymic asthma occurs in infants, and is a laryngeal spasm induced by pressure of the thymus upon the inferior laryngeal branch of the pneumogastric. The essential lesion of angina pectoris has not, as yet, been discovered. It is manifested in a spasm of the arterioles generally, which interferes with the circulation of blood to such an extent as to produce, in addition to the frightful pain and feeling of impending death, a well-marked dyspnœa. The asthmatic paroxysms of chronic Bright's disease are due, according to Dr. George Johnson, to spasm of the pulmonary arterioles, obstructing the passage of

blood through the lungs. Tumors and aneurisms induce spasm by their irritant effect upon the nerves which they compress.

Patients suffering from spasmodic dyspnœa usually assume the sitting posture, partly because the respiratory muscles can be more easily used with the body in that position, and partly on account of some nervous vaso-motor condition not yet explained.

In the examination of patients, it is necessary to distinguish between dyspnœa and simple accelerated breathing, and also between true and false dyspnœa.

Pyrexia is usually accompanied by increased rapidity of respiration; this increase is not, however, as marked as where there is actual obstruction to respiration. The heated blood, coming in contact with the ganglion cells of the medulla, is, apparently, the exciting cause of the greater rapidity of the discharges. In individuals of an excitable nervous organization, and particularly in infants and children, the respirations may be greatly increased in frequency from this cause. It will be found, upon careful observation, that these rapid movements are very superficial, causing little if any actual increase in the amount of air respired. This is an important point to the diagnostician, for we are sometimes in doubt as to the true significance of this symptom. Careful auscultation and the observation of the superficial nature of the breathing are our best aids under such circumstances.

This paper would be incomplete if I failed to call attention to a group of symptoms for which I propose the name of *hallucinatory*, or *false* dypsnœa. The instances that have come under my notice have been in women, of a neurotic tendency, but who did not, at the time of the examination, exhibit any of the ordinary hysterical symptoms. The sensation of suffocation is genuine and intense. The

patient sits up in bed, with anxious face, laboring for breath. But the face and mucous membranes show no signs of cyanosis, and the heaving of the chest, with free expansion and contraction, shows that there is no obstruction to respiration. Percussion and auscultation give no signs, save those of a healthy chest. The distress, evidently, has its origin in disturbance of some higher centre, the medulla being stimulated from above. The condition seems to be analogous to hallucinations of sight, hearing, etc., in which the central disturbance is referred, in consciousness, to the periphery.

It is possible that the spasmodic dyspnœa of Bright's disease is of somewhat similar character.

METALLO-THERAPY, THEORETICALLY AND PRACTICALLY CONSIDERED.

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PART II.—METALLO-THERAPY, PRACTICALLY CONSIDERED.

SINCE metallo-therapy is what Charcot calls the "grand *chef-d'œuvre* of empiricism," the profit which arises from the investigation of the subject comes not so much from a discussion of its interesting and elusive theories as from a review of the cases in which it has been found serviceable, and in answering the questions: "What are the effects produced,—what are the methods of its application?"

The word metallo-therapy in this part of the article will be used in its strictest sense, that is, to designate the employment of metals and not other *œsthésiogènes* in the healing of disease.

Report of Cases.

By far the greater number of cases reported improved or cured by metallo-therapy have been those of the hypo-neuroses. The impression prevails that the metals can only be used in hysterical cases, especially those accompanied by anæsthesia of general and special sensibility. Charcot found, as has already been stated, that the effect of metals upon anæsthesia where cerebral lesions existed was more speedy and lasting.

If space permitted it would be very interesting to quote some of the typical cases of anæsthesia, hysterical and otherwise, which have been improved by the use of metals. As it is I can do little more than to catalogue them. Foremost are those published by the Committee of the Société de Biologie, which are models of careful scientific investigation.[1] Among the earliest reported cases are those of Despine,[2] in which hysterical affections were cured or ameliorated by gold. Charcot[3] has published a number of cases which prove the efficacy of this treatment in these diseases. Decrand,[4] Mouricourt,[5] Landouzy,[6] and Garel[7] have put on record cases of hysteria cured by gold, sometimes used externally, at other times used both externally and internally. The interesting experiments of Westphal[8] should be alluded to. Eulenburg[9] reports a case of chlorotic anæsthesia cured by the external and internal administration of gold, after the trial of iron, steel, and copper, tin, zinc, and nickel. Bernhardt[10] publishes four cases of grave and inveterate hysteria, in three of which the symptoms were ameliorated and the fourth was healed. Corivean[11] gives the case of a girl with anæsthesia and muscular paralysis cured in four days by gold used externally and internally. Aigre[12] in his thesis mentions several cases.

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[1] Étude experimental sur la metalloscopie et de metallo-thérapie du Dr. Burq. Premier et second rapports.

[2] *Ann. de phys. et de chimie*, t. xii, an. 1823; quoted in *Lyon méd.*, 1880, xxxiv. La metallo-thérapie en 1820.

[3] *Gaz. des hôp.*, 1878. Compte rend. d. soc. d. biol., 1878.

[4] *Gaz. méd.*, 1878.

[5] *Le Prog. méd.*, Jan., 1880, p. 86.

[6] Compt rend. d. soc. d. biol., 1879.

[7] *Lyon méd.*, Jan. 11, 1880, t. xxxiii, and juil 4, 1880, t. xxxiv.

[8] *Berl. klin. Wochensc.*, 29 Jul., 1878.

[9] *Wien. med. Presse*, Jan., 1879.

[10] *Berl. klin. Wochensc.*, 1878, p. 129.

[11] *Mém et bul. de la soc. de méd et de chim. de Bordeaux*, 1878, p. 138, quoted by Petit in *Bul. gén. de thérap.*, 1880.

[12] Aigre: *Thèse de Paris*, 1879, quoted by Petit.

Bouchut[1] had a case of hemi-anæsthesia in a girl subject to epilepsy, cured by gold and bromide of potassium.

Besides the cases of anæsthesia of cerebral origin reported by Charcot, Landolt and Oulmont speak of cases where there has been a return of sensibility in hemi-anæsthesia of cerebral origin by application of gold. General and special sensibility returned and persisted three months, with a diminution of chorea which was present.

Examples are not wanting where anæsthesia of the special senses has disappeared upon the use of metallo-therapy. In a number of the cases already mentioned the special as well as the general sensibility was involved and yielded alike to the treatment.

Feuzal[2] describes a case of general anæsthesia, amblyopia, dyschromatopsy, treated for three months with chloride of gold internally, and bracelets of gold on right forearm, and pieces of gold on her forehead. She was made sleepy by them. Dujardin Beaumetz and Ch. Abadie[3] have published a case of blindness improved by gold and cured by static electricity. Charcot[4] mentions instances of achromotopsy with lesions of posterior portion of the internal capsule, as well as hysterical, cured by metallo-therapy. In one of my cases, which will presently be reported in detail, the hearing was restored; and I cite the following observation of the effect of zinc upon the taste, since few cases are recorded, and also as illustrating the rapidity of the action of the metals and the result, as determined by the æsthesiometer eliminating expectant attention and imagination.

Obs. 1.—Patient was a young man, express-driver, under treatment at Throat Department of Manhattan Eye and Ear Hos-

[1] *Gaz. des hôp.*, Apr. 18, 1878.
[2] *Prog. méd.*, janv. 4, 1879, p. 3.
[3] *Prog. méd.*, juil. 12, 1879.
[4] *La France méd.*, April 17, 1878.

pital for subacute laryngitis; complained of dysphagia, sense of oppression in his chest; felt as if he could not breathe. Said he could not taste any thing. When tested, could not tell the difference between common salt and sulphate of quinine. Anæsthesia bilateral. Could distinguish between one and two points of æsthesiometer in a hesitating manner at 2½ cm. Applied zinc disk, fifteen minutes after which æsthesiometer showed that he could tell points at 5 mm., which he did accurately and with increasing readiness. Could taste salt but not quinine. Patient lost sight of after this experiment.

The effects of metallo-therapy in anæsthesia have been so carefully investigated and so fully recorded that I have not turned my attention especially to that branch of the subject, but rather to the hyperæsthesias. Nevertheless, two cases in which I have used the metals so well illustrate some of the peculiar points of metallo-therapy, that perhaps they should be given.

Obs. 2.—Patient, a young lady at the New York Infirmary for Women and Children, suffering from anteflexion, endometritis with dysmenorrhœa and metrorrhagia. One night she complained of numbness and lack of sensation in left hand and arm, extending to the shoulder. She attributed the trouble to holding a heavy book which she had been reading. Æsthesiometer showed sensibility in hands alike and normal. At the inner aspect of left forearm distinguished points only at 4 cm. In the corresponding portion of the other arm at 2½ cm. Pin-prick in this zone down to the muscular layer gave no pain and drew no blood. Placed over the anæsthetic portion nine copper disks. In twenty minutes removed them when sensibility was found to be the same—2½ cm. in both arms. It gave her so much pain that I could not prick deep enough to see if the blood would flow.

Still complained of numb feeling in the hand. Tested again with æsthesiometer, and ring finger showed less sensibility than before. Disks placed around hand and removed after fifteen minutes, when sensibility was restored and numb feeling had passed away.

The disks were left with the patient, who said next morning that the numb feeling returned once or twice in the night; when she put on the disks it passed away. She said that she had had a

sharp pain down her shoulder and arm, which had also disappeared with the use of the disks.

The trouble did not entirely subside until the third day, during which time she had used, at intervals, zinc and copper disks. "I wish to tell you something very strange," she said; "when I wore copper disks I had such a burning sensation under them; but the zinc disks felt entirely different,—they felt cool. When I had the pain in my shoulder to-day, zinc did not relieve it as soon as the copper, but made the pain different; the sharp pain became a dull ache." Iron had also an effect on this patient, but the results were not produced as quickly as by copper or zinc. These metals have also with her an hypnotic effect.

Obs. 3.—Dispensary patient; a young Jewess; sewing girl. Case was diagnosticated as one of purely hysterical anæsthesia. Her trouble came on in February, 1882, at which time she thought she must have taken cold. Menstruation regular and normal. There was nothing pointing to uterine or ovarian trouble. No examination was made.

She was, at the time of the beginning of her attack, anæsthetic over the right half of the body; but she had received, up to May, 1883, when she came to me, faradism, three times a week, including the faradic brush, under which treatment the anæsthesia had disappeared from the lower extremity. At this time (May 24th) her general condition was good. She complained of a numb feeling in the fingers of her right hand, which made it difficult for her to hold or pick up a needle. Her right arm gave her a sense of weight and heaviness. It was difficult for her to raise it to her head, and especially difficult for her to comb her hair. Her hair was somewhat thinner and 3 to 4 cm. shorter on the right side than the left.

Examination: She could feel a touch, but could not readily distinguish the points of the æsthesiometer in some parts of the hand and arm, and not at all in a zone in the neck, extending from the ear down the integument covering the sterno-cleido-mastoid muscle and the upper portion of the trapezius. Taste, smell, and sight were normal, but her hearing was impaired in both ears. Hearing distance—right ear, $\frac{18}{40}$; left ear, $\frac{36}{40}$. Tuning fork showed aërial conduction better in both.

While the tactile sensibility was normal in both hands and both arms, the skin on left side could be pierced to any depth without pain; she had only the sensation of having been touched. No flow of blood followed the pin-pricks.

She wore nine zinc disks fifteen minutes, after which there was a return of sensibility to pain in hand, and flow of blood at the points pricked with a pin. Hearing also improved: left ear, $\frac{40}{40}$; right ear, $\frac{36}{40}$.

May 27th.—Sensibility better than before the use of disks on the previous occasion. Tried five disks instead of nine, with no result except in hearing, which was very slightly improved.

May 31st.—Put on nine zinc disks for twenty minutes; no marked improvment in areas of analgesia, though the latter was not as marked as on the examination May 24th.

Hearing distance—right ear, $\frac{30}{40}$; left ear, $\frac{36}{40}$. Slight increase after wearing the disks.

June 5th.—Gave her copper disks, which she wore for the last three days constantly. She complained of burning sensation in her arm, which continued night and day. Sensibility in back of hand greatly increased. Could not stick pin in to draw blood without great pain, and blood flowed after pin-prick. The zone in neck, in which she had not been able to tell points, even at wide distance, showed an improvement. She could tell points at 5 cm.

June 11th.—Patient had not worn disks. Hearing—left side, $\frac{40}{40}$; right, $\frac{30}{40}$. Sensibility in zone in neck $3\frac{3}{4}$ cm.

Said arm felt much less heavy. Complained of numb sensation in fingers, especially of index finger of right hand. Æsthesiometer showed sensibility much the same in both hands; little less in tips of right than of left. No flow of blood when pricked.

After copper twenty minutes: Sensibility of neck not increased, rather diminished; hearing remarkably improved.

June 14th.—Said she felt much better. Arm less heavy; less burning feeling at night, of which she had complained. Still fingers very numb; could not tell if she had a needle in her hand if she did not see it. She could comb her hair more easily than ever before since she had been sick, for she could raise her arm more easily to her head.

She could tell points at $3\frac{1}{2}$ cm. on right side when the pressure was hard; except in one zone over the middle third of the sterno-cleido-mastoid muscle; while she could feel a touch she could not feel a pin, and when it was thrust in deeply no blood followed it.

After copper thirty-five minutes: Pin-pricks in analgesic spots were painful; blood followed; could tell points with less pres-

sure. Sensibility was at 3 cm., while on left side at $2\frac{1}{2}$ cm. There was more sensibility to pain in fingers.

June 30th.—Had not been to see me for sixteen days, during which she had had no treatment. Hearing in right ear, $\frac{30}{40}$; left, $\frac{40}{40}$. Hand and arm same as before; perceived points at the same distance on right as on left, except third finger more insensible than others,—required more pressure. Zone in neck almost as analgesic as ever; nevertheless, could tell once in a while at long distances 5 and 6 cm., if there were two points.

After copper, thirty minutes: Hearing $\frac{40}{40}$ on both sides, first time since I had examined her. Sensibility increased in right hand so that she could feel the slightest touch. Tested while the disks were still on. She had a sensation of two points, and answered "two" wherever touched, whether one or two points of æsthesiometer were used. Bracelet of nine disks were then placed around the wrist. After ten minutes removed them all, when there was normal sensibility, increased appreciation of pin-pricks, and she could tell accurately and quickly as in left hand, notably in third finger which was less sensitive before.

July 3d.—Hearing in right ear $\frac{30}{40}$ to $\frac{40}{40}$ in left. Sensibility in fingers remained improved, though not the same as when disks were removed. Said her arm was much lighter. Put copper disks over zone in neck and zinc around her arm, which were to be left on until she came again.

July 5th.—Wore disks until the afternoon of July 4th, when they burned so much she was obliged to take them off for two hours. Arm felt heavy. She felt burning more under the zinc disks than under the copper ones (the reverse of the preceding case). Under the copper a papillary eruption was to be seen, with points here and there which had bled. Over anæsthetic zone in neck could tell points at 5 cm. surely, and was generally right at $3\frac{1}{2}$ cm. On left side in the corresponding region could tell them at $2\frac{1}{2}$ cm. Sensibility about the same in both hands. Hearing in both ears the same and normal.

Patient said she could tell now when she held a needle in her right hand, which she had not been able to do since she was sick, and could distinguish one object from another by touch, which she could sometimes do after having received faradism. Then, however, the power only remained a part of the day, but since she has used disks it has been permanent.

July 7th.—Patient wore copper disks five hours on July 6th,

and five hours this morning. Could tell points of æsthesiometer in zone of neck 2½ cm. if pressure was great. Said her hand burned when the disks were worn on arm or shoulder. Complained more of index finger, which felt the prick less than others.

July 18th.—Patient said she felt very much better than she had since she was sick. Gave her sulphate of zinc .12, to be taken three times a day. Took off the metals.

July 21st.—In zone in neck with more pressure tells the points as on the other side at 2½ cm. Face, arms, and hands normal. Hearing alike on both sides, which has been the case since July 5th.

Patient was lost sight of on account of my absence from the city during the remainder of the summer, and I have not seen her since, so that I cannot tell if this return very nearly to normal sensibility was permanent or not. The first patient I have seen now four months since the time of the attack of anæsthesia, and she has had no return of it. There was no transfer in either of these cases.

Cases where there is loss of motility of varying degree, from muscular weakness up to the more serious manifestation of paralysis, have been favorably affected by the use of metallo-therapy. This has been shown in many of the cases already mentioned. Petit[1] quotes cases of paraplegia and hemiplegia of toxic origin, which have been benefited by metals, two of which were cases of lead paralysis.

A case of hysterical anuria has been reported[2] cured by the application of Dr. Burq's armatures over the vesical region. Gold was not successful, but several of the other metals were. I have used them in a case of hystero-epilepsy in a girl of fifteen, who said that sometimes a week would go by without her being able to pass her urine, when she would suffer greatly and go to hospitals and have the catheter used. When she came to me, according to her story, two

[1] *Bul. gén. de thérap. Loc. cit.*

[2] *Brit. Med. Jour.*, April, 1879.

or three days would intervene in which she was unable to evacuate the bladder. She was treated with copper, zinc, and iron disks over the spine and vesical region, and gradually she has come to urinate normally.

I have used the disks a number of times where catheterization was necessary after operations and after labor, but never with the slightest success.

In the hyperneuroses, metallo-therapy, though used to a much less extent, has proved successful. Hysterical[1] and other contractures,[2] chorea, writer's cramp,[3] neuralgia,[4] angina pectoris,[5] and clonic[6] as well as tonic spasms have yielded to metals. In the case of rhythmical myoclonus, which I reported at length in a recent number of these ARCHIVES,[7] the efficacy and peculiar effects of different metals were shown, as well as the difficulty of accounting for these on the hypothesis of "expectant attention."

OBS. 3.—In a child of eleven the supinator longus muscle of the right arm and certain of the inner hamstring muscles of both lower extremities contracted regularly and rhythmically before the use of disks of plated gold. After wearing them fifteen minutes, they fell from sixty to fifteen contractions per minute. They were also changed in character—from regular and rhythmical to irregular and tetanoid. Once, after keeping the disks on all night, the contractions became very few, feeble, and irregular.

Copper reduced them from forty to eight per minute. They remained clonic, but were distributed into groups of one, twos, and threes. Zinc reduced them from thirty to three per minute, and they remained clonic. Silver was tried with no result. The effect of the metals was not lasting.

After a few hours the contractions increased and in several days were as numerous as ever.

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[1] *Gaz. des hôp.*, Apr. 18, 1878.—M. Bouchut.

Gaz. des hôp., 1882, p. 764.—Chantemeisse.

[3] *Gaz. des hôp.*, 1881, p. 460.

[4] Les surprises et les etonnements de la metallo-thérapie.—Burq, *Gaz. des hôp.*, 1882.

[5] De la chorée rhythmique.—Charcot. *Prog. méd.*, Feb., 1878.

[6] *Gaz. des hôp.*, Sept. 2, 1879, p. 808.

[7] ARCHIVES OF MEDICINE, April, 1883.

The use of metals in spinal hyperæsthesias was suggested to me by the following case. I had not seen the treatment recommended, and had made most of my observations before chancing upon a short article by Benedict[1] in the *Wiener Presse*, in which he reports good effects of zinc disks placed along the length of the spine in hysterical spinal irritation.

Obs. 4.—H. C., admitted to N. Y. Infirmary for Women and Children September 4, 1882. Patient was unmarried; age twenty-five. Diagnosis: hysteria, endometritis, and retroversion. Uterine condition improved under treatment, and the uterus returned to its normal position, but the severe back-ache of which she complained when she came resisted every thing. Dry cups, actual cautery, ice to the spine, galvanism, were tried one after another. There was great tenderness over the spine, varying in region from time to time. The slightest touch made her jump. I had the metals, to try them in the case of clonic spasms just spoken of, when without having any faith in their efficacy, and having little idea as to how they should be used, I placed them, zinc, copper, silver, and gold, over her upper dorsal and the cervical region, the places where there was the most pain. Very soon she complained of experiencing a peculiar, indescribable sensation, and that the pain had left the place under the disks and was felt in the sacral and pelvic regions. The metals were moved to the site of pain, when she soon after complained of a queer feeling in the top of her head. The metals were placed there, and remained during the rest of the application, fifteen minutes. The next morning she said that she turned in her hed, the first time since August (two months), without pain. The whole appearance of her face was changed. Instead of dark circles under her eyes, and a face expressive of weariness and lassitude, her cheeks were red and her eyes bright. There were a vivacity and a hopefulness about her quite unlike any thing she had shown since she came into the hospital. She attributed the whole change to the metals, which she said had had a magic effect. I gave the credit of the magic effect to her imagination. At noon I tested the sensibility of her hands with the æsthesiometer, and found that she could not distinguish between one and two points at 5 cm., not even on the palmar surface of the fingers. I wrapped copper disks around

[1] *Wiener Presse*, 26 Jan., 1879, No. 4.

one hand and zinc disks around the other. After leaving them fifteen minutes I tested, to find that she had normal sensation in both hands, and could tell accurately whether one or two points were used without making a mistake or hesitating. She said she felt very much better after this application, and left the hospital the next day, announcing that she was cured by the disks. This was in November. I saw her from time to time during the winter, but she had had no return of the distressing spinal symptoms.

In June she had a recurrence of her uterine trouble, and a suggestion of the old pain in her back. Examination showed tenderness over the spines of the vertebræ in lumbar region. A string of a dozen plated gold disks was applied, and during the twenty minutes they remained on she described her sensations, a record of which I had kept, in exactly the same words as when she had tried them in November,—the queer, indescribable sensation and the shifting of the pain. After the disks were removed the sensitiveness disappeared. I could press upon the vertebræ without any sign of pain. Before using the disks I tested the sensibility with the æsthesiometer. She distinguished points at 5 cm. ; after the discs, at 2½ cm.

Obs. 5.—Case of hystero-epilepsy in a girl of fifteen, already alluded to as a case of anuria, in which zinc and copper disks had a marked effect. She was one of the most hyperæsthetic persons I ever saw. The least touch of the finger, especially in the lumbar region and over the hypogastrium, would cause her to draw away in a kind of spasm. She first wore copper, which had the effect of making her pass her urine regularly. The urine was normal in color, acid, Sp. gr. 1014, and contained no albumen. She improved constantly after wearing a chain of nine zinc disks. She could be touched anywhere without shrinking, and could bear any amount of pressure over the vertebræ and hypogastrium. Her color improved, and she could stand straight. When she came she was much bent over and was a most forlorn-looking object. After this she received a great fright and came back in as bad a nervous condition as ever, except that she passed her urine regularly. The hyperæsthesia again subsided under the use of tin, and also after iron. Wretched surroundings, poor food, insufficient clothing, and a mother who beats her make it doubtful if she would receive lasting benefit from any treatment.

Obs. 6.—Private patient, A. N., young lady, single ; complained of great pain over the upper dorsal, cervical, and occipital

regions. Spines of vertebræ exceedingly tender. Could not bear the slightest touch. Could not lean back against a chair.

Had used actual cautery, ice, constant and interrupted current, without any permanent benefit.

March 23d.—Applied nine zinc disks; pain greatly increased.

March 24th.—In the morning a feeling of tenseness, stiffness, and pain, which disappeared after moving about. Was surprised to find herself leaning back in a chair without being conscious of her spine. Disks removed upon retiring.

March 25th.—Pain in lumbar and dorsal regions, but of a much less degree and occurring at intervals. Disks removed at night.

March 26th.—No pain.

Disks were worn a week during the daytime, after which they were left off. Pain has not returned up to the present time—more than six months.

The following cases, which were relieved by the metals, and a number more which I will not take the space to report because of their similarity, did not have marked hyperæsthesia as a symptom, but persistent pain in the back was present, sometimes as the only trouble, at other times accompanied by some disease, mostly uterine.

Obs. 7.—H. L., lady, single, twenty-five years old, patient in private practice. Two years before had operation for congenital retroversion; the uterus was bound down. Since then has had feeling of pain and dragging sensation in lumbar and sacral regions. Had received spinal douche, general faradization, and massage without improvement. Patient was anæmic and easily exhausted. Put on a chain of plated gold disks, which she wore constantly for two weeks. During that time she greatly improved. Was able to walk without sense of fatigue, and to wear heavy clothing. Had not been so free from back-ache for two years.

Obs. 8.—Dispensary patient; young woman, age twenty-six; married. Diagnosis: anteflexion. Complained continually of pain in her back and left leg, which was not relieved when the uterus had been replaced. Wore nine zinc disks. The first week pain was much better; the second week pain passed away entirely. She was able to do her house-work, and to stand at the ironing-table and do her ironing, usually her hardest task, because of the pain. The trouble had not returned when last seen, ten months from the time she had used the zinc.

Obs. 9.—Dispensary patient. Young woman; single. Diagnosis: anteflexion and endometritis. Had been coming to the uterine clinic for a long time. Always complained of great and peculiar pain in the lumbar region. One day gave her the copper disks. It was three weeks before she came again, when, in answer to inquiries, she said her back had been entirely cured. She used the disks three times on three successive evenings, and each time, after wearing them fifteen minutes, the pain passed away. It did not return after the third application. She has other aches and pains, and her uterine trouble persists; but she always says that the old unbearable pain never has returned in her back.

In these cases which have been given, there was very little opportunity for experimentation. The metals gave effects so speedy and so marked that there was no room to doubt that the result was due to their use.

Aside from the therapeutical aspect, two points suggest themselves:

First:—The wide disparity between what was accomplished and the means, making of striking significance the remark of an experimenter who has said the *æsthésiogènes* were not comparable physically, but physiologically. Galvanism and faradism had been tried in so many instances and failed, when metals were successful, and that most powerful excitant, the faradic brush, had been used in one case of anæsthesia which I have cited, and in a number reported by Westphal:

Second:—The fact that weak currents have restored sensibility where strong ones have been unavailing. If the result of the metals is not due to electricity, may not their effects be explained and come under the formula of Regnard, in a figurative if not a literal sense, who says that: "In the galvanometric scale there are certain points constant in each individual case, at which sensation is recalled (or restored to normal) by the action of the current, whereas this does not occur when the current is either weaker or stronger, however long applied."

Burq[1] says that the metals are good in psychical disturbance, and brings forward to prove it a case of a woman in a raving delirium brought to her senses by the application of silver. He adds, that in patients at Salpêtrière who committed all sorts of eccentricities, when metals were used that sort of moral anæsthesia disappeared like the physical anæsthesia. They became docile and affectionate, and conscious of their duties.

Three cases are on record in which ill effects were produced by the metals. Dumontpallier[2] tells of a case of hysteria not yet pronounced, which was determined by the application of copper; gold, iron, and silver having been tried without result.

Aigre[3] reports a case of insensibility occurring under plaques of gold applied for two hours to forearm; silver obtained nothing. Sensibility returned little by little at the end of four hours. Vergeley[4] gives a case of hysteria in which, after the use of copper and iron, sciatica was the result. Gold had no effect.

Methods of Using the Metals.

"The use of metallo-therapy" says Vigoureaux, "is not an easy thing; it exacts on the part of a physician great practice. This is certainly one of the reasons why the methods of Dr. Burq have so much difficulty in becoming popularized." Another reason might be alleged, that definite methods for the application of it have not been laid down, and the physician is left to his own devices and to his own experimentation to work out a practical system.

Briquet brings as a reproach, not without foundation, that metallo-therapy has been practised for some time in a

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[1] *Gaz. des hôp.*, Nov., 1882.

[2] *Brit. Med. Journ.*, Oct., 1878.

[3] *Thèse de Paris*, 1879.

[4] Quoted by Petit: *Bul. gén de thérap., loc. cit.*

vague and spasmodic manner. I have failed to find any comprehensive directions which one could follow. This is the excuse for the lack of method in the application of metals, which is apparent in the report of cases which I have given.

There are three methods used in metallo-therapy: 1. The external. 2. The internal. 3. A combination of external and internal.

Metalloscopy is the first thing to be taken into consideration. By this word is meant the selection of the metal or metals adapted to the individual. One must recognize the peculiar fact in connection with the use of metals—that of personal idiosyncrasy. It is what Burq calls the "personal sensibility" to metals. He believes and advances the fanciful idea that there is a direct relation between the diffusion and abundance of metals in nature and their application; consequently he gives this order in which to try the metals, as also does Charcot,[1] iron, zinc, copper, gold, silver, tin, and platinum. Vigoureaux[2] says that in one hundred, seventy are affected by iron, while thirty are by the remaining metals. Garel[3] finds gold to act more frequently than iron, and places copper next. He met one patient who responded to lead and to no other metal. Certainly from the reports of cases where metallo-therapy has been successful in hysteria, one is inclined to agree with him, and also with Despine, who placed gold at the head of the list.

Persons are sensitive to more than one metal. Where polymetallism, as it is called, exists, it often occurs that no one metal will give complete results. For instance, zinc may affect the vascularity of the skin and the temperature, but not increase the muscular force. It is also stated[4] that

[1] De la metalloscopie et la metallo-thérapie.—*Gaz des hôp*, mars 7, 1878.

[2] Metalloscopie, metallo-thérapie æsthésiogènes.—*Arch. de Neurol.*, 1880, *loc. cit.*

[3] *Lyon méd.*, 1880.

[4] *Prog. méd.*, juil. 27, 1878.

the effects of metals, as well as that of magnets and electricity, can be prolonged at will by using a neutral metal, which will generally be found to be among those which rarely produce results. It can be placed over the metal or point of appreciation, or anywhere between it and the central nervous system.

If a metal, after a week's trial, has produced no effect, says Du Montpallier,[1] it is useless for that case, and must be exchanged for another. In making the experiment it is better to wait two or three days before trying another. This may be the proper way of thoroughly testing the matter; but my experience has been, if there are to be effects, there is usually some evidence of it in half an hour.

The form in which metals have been used externally have been disks or plaques. Dr. Burq's armatures, of which one reads so much, are composed of round pieces of metal three cm. in diameter, made with a slide upon the back so that they can be strung on a ribbon. Those which I have used in the cases reported are 3½ cm. long and 3 cm. wide. The shape can make no difference.

Some authors, especially those who hold the chemical theory, direct that the metals used should be of the purest. That they should be perfectly smooth, especially upon the edges, that they may not abrade the surface of the skin, is apparent. In some of the cases reported it will be seen that plated disks were used. If the metal were plated on an inactive or neutral one, it would be supposed that there would be no result; if there were effects, it was because the person wearing them was susceptible to both metals. If, however, as was the case in those used, they were plated on both sides, then the result, according to Vigoureaux, ought to be the same as if a simple metal were used; since, if the gold were plated on copper, it were the same as if two

[1] *Gaz. d. hôp*, juil., 1879, and *Brit. Med. Jour.*, Nov., 1879.

gold pieces were used with copper between, and, according to the law of tensions already quoted, the result would be the effect of the extremes of the series, or of the skin and the last piece of gold.

After testing the sensibility, Dr. Burq's plan was to drape different parts of the body every day with metals. He continues his applications daily for fifteen weeks, when the patient is better. After a time if the trouble reappears, the treatment is resumed. Charcot places his metals upon the forearm.

The number of disks or the amount of metal makes a difference, as one would suppose, in the result. In the experiments referred to by the Société de Biologie sometimes only a single piece of metal or a coin was used. In Obs. 3, I used once five disks with only a very little result, whereas with nine both hearing and anæsthesia were improved. I have seldom used more than from nine to twelve. If any results at all were to be had they were to be had with that amount.

Sometimes Burq uses a very large number, "draping his patients," as some one has described it, "as if with mail."

The time requisite to obtain effects varies, according to Vigoureaux,[1] from thirty seconds to twelve hours. At Salpêtrière they were rarely used more than an hour.

When used for purely therapeutical use and not for experimentation, it is not necessary to limit the time. In the cases of spinal irritation which I have reported, the directions given have been to wear them until the pain and tenderness subsided and then to take them off and not put them on again until there was a return of the symptoms. The metals, in many instances, lose their effect if worn continuously, and if there is an increase of the original trouble the

[1] *Arch. de Neurol.*, 1881, *loc. cit.*

same metal is not as serviceable as before. The maximum effects are obtained in the short time mentioned above, and while no change may occur from continuing to wear them, it is seldom that an increase of results is obtained.

Burq regarded the external use of metals as simply a stepping-stone to the internal use. The internal therapeutical action, he claims, always corresponds to the external, and the latter should be employed to determine the personal idiosyncrasy. The metals have been administered internally in the form of powders, finely minced metallic leaves, and in the various salts. It matters little which form of the salt is employed. It is given hypodermically when the stomach is disturbed. Lead, as might be surmised, is not in the metal pharmacy. Sometimes mineral waters, when they are known to contain a certain per cent. of the metal desired, are used. The connection of the beneficial effects of mineral waters with metallo-therapy has been suggested.

Effects of Metals.

If the metal used is not the one adapted to what Burq calls the "metallic sensibility" of the person there will be no effect whatever; if, however, it is, the sensation most commonly experienced is that of warmth, from a very slight degree to that of an almost intolerable burning. One patient who wore the disks for pain over the spine said that they felt warm and comfortable; that before she had always a chilly creeping sensation, from which it was delightful to be free.

After removal of the disks the skin beneath is often red, varying in degree from a slight erythematous blush to a deep color. In some, small vesicles have appeared. It may be thought that the redness is only such as would result from the presence of any foreign body, and would occur in any case. This is not so, since one kind of disks

may occasion it when another will not. Once or twice the patients have complained of the disks feeling uncomfortably cold, even though they had been on for hours, when one would have supposed that they would be of the body temperature.

Great perspiration occurs sometimes beneath the disks.

Prickling sensation, heaviness, and great sleepiness are often spoken of. The last is so common an effect as to suggest the use of the metals as an hypnotic. In several instances they have proved very effectual as such. In one case silver disks were employed with success where opium had been taken previous nights without result.

There is an increase of muscular strength as measured by the dynamometer; an increase of temperature of the surface of the skin to which the metals have been applied; a return of general sensibility where there have been anæsthesia and analgesia; also a return where there has been loss of special sensibility: in both instances there may or may not be a transfer of sensibility from the unaffected side to the other, of just so much as it has gained.

In achromatopsy it has been found that the colors follow a regular order in the return of power to distinguish them, and that in the inverse order in which the power was lost,[1] which is violet, green, red, yellow, and blue.

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[1] De la metalloscopie et de la metallo-thérapie.—Charcot : *loc. cit.*

UPON TRANSFERRED PATELLAR TENDON-REFLEX.

By ALLAN McLANE HAMILTON, M.D.

OUR attention is sometimes directed to anomalous cases of disease of the nervous system in which the so-called transfer symptoms exist. In those examples, when associated movements which are so common in various phases of pyramidal degeneration are present, the pathological explanation may lie in a cerebral or spinal commissural arrangement.

In alluding to the existence of reflex excitement in connection with lateral-column disease, Ross and others call attention to certain crossed-reflexes which are evoked when the periosteum or fasciæ are the initial points of shock. In 1873 I pointed out the fact that in irregular posterior spinal sclerosis it was possible by galvanization of the quadriceps of one extremity to produce contraction of the muscle in the other. Since that time various observers have noticed the same phenomenon, and the transfer of reflexes, not only in posterior spinal sclerosis, but in other diseases, has come to be accepted as a clinical fact. The following history is one which demonstrates a much more interesting phase of reflex activity than any I have seen, and I think it proves that in certain cases there is a direct and limited crossing of centripetal impulses in the cord.

L. J., aged 48, is a man of good habits, yet a rather free liver. His family history discloses no nervous disease, and there is no

reason to suspect syphilis. He has led an active life and done much hard work. About four years ago he began to manifest the symptoms of his present malady. He was restless, irritable, and at times melancholic and depressed. He was rather boastful, yet his extravagant talk was not that of dementia paralytica, and had some basis. About this time he found that the right upper extremity was weaker than the left, and that it became agitated by tremor which increased when he attempted some complex act. Subsequently the left upper extremity was affected in the same way, and then the legs in turn became weaker and he was obliged to discontiuue his daily horseback exercise and his walks, and only left his house when obliged to do so. He had some pains in the lower extremities, mainly confined to the nerve-trunks, but there was no anæsthesia.

I saw him in April last and he has since been under my care. In appearance he presents the facies of Parkinson's disease, and his eyes have an anxious and sorrowful expression. Facial innervation is weak, and fibrillary twitchings, especially of the muscles about the mouth—the orbicularis and levator anguli oris, are quite decided when he attempts to speak. His tongue is the seat of a coarse tremor, with convulsive retraction of the whole organ when it is protruded. His speech is "scanning" and somewhat explosive at times, and labial and lingual articulation is decidedly at fault. Both optic disks show commencing gray-atrophy, but there are no evidences of paresis of the muscles of the eyeball, and no hemiopia. The right pupil is larger than the left. He sits with head bowed and body curved.

There seems to be a general tremulous condition of the entire frame when at rest, and as well, a marked voluntary tremor. This is increased when he is excited. His walk is unsteady and feeble, his feet are somewhat separated, and he sways to and fro when progressing, and seems to be impelled forward; in fact, there is conspicuous festination. The muscles respond, if any thing, rather too actively to both currents, when directly or indirectly applied, and the electric sensibility seems unaffected. He has a rather active expulsion of urine, but beyond slight constipation his bowels are unaffected. His general physical condition is as good as it could well be. Mentally he is disposed to be boastful regarding his professional career and income. The burden of his conversation is about the value of his jewelry and pictures, the extent of his business, and his elation suggests dis-

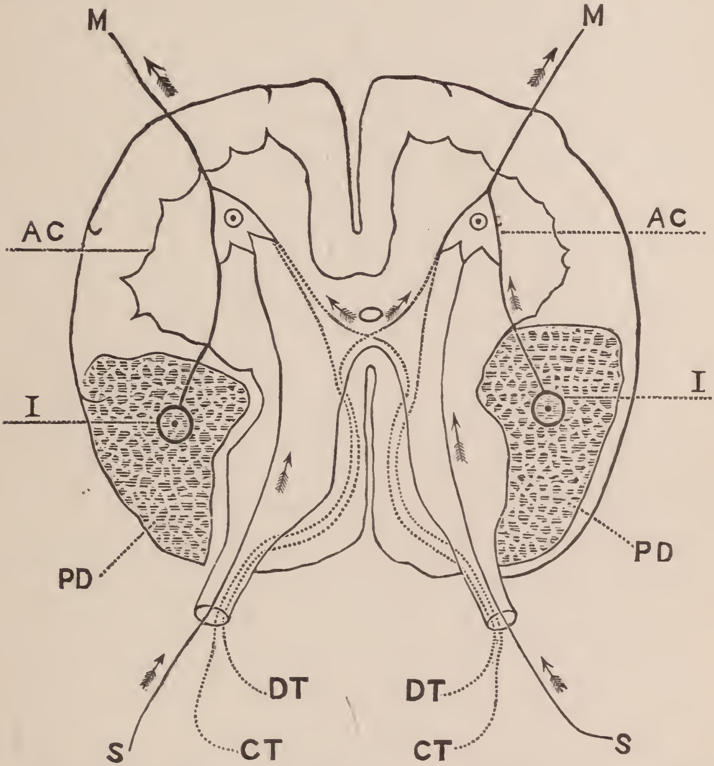
ease. He cannot write except with great effort, and his attempts result in "shakiness," and badly formed words.

The *reflexes* are all exaggerated on both sides, and the slightest cutaneous or tendinous irritation gives rise to decided motor excitement. When in a constrained position, or when both feet are placed upon a chair, a violent and continued tremor is induced, the ankle-clonus is bilateral and violent, and the Achillar-reflex lifts each heel quite forcibly. The cremasteric, abdominal, and upper reflexes are all pronounced. When his thighs are supported so that both legs hang loosely, a very curious phenomenon is witnessed. I have upon three separate occasions made the test and have evoked a limited crossed-reflex; that is to say, when the right patellar tendon was struck a light blow, the opposite leg would present the jerk, and the left foot would be thrown out. When the left patellar tendon was tapped, the result would be reversed. There would be no jerk upon the side struck, but the muscular action would invariably follow in the other limb. I was at first disposed to look upon this peculiarity as a chance expression, or perhaps an associated contraction, but its constancy, and the fact that the muscles of the excited side did *not* respond, convinced me of the curious and extraordinary nature of the symptom. None of the other reflexes were transferred.

Ross,[1] as I have said, speaks of certain "periosteal" and "fascial" reflexes, and refers to the results he has obtained by tapping the middle of the tibia, and other like sites, when ensuing contraction of the quadriceps upon the same or opposite side, as well as of the adductors, would follow when the legs were extended. Though closely resembling the motor disturbance in my patient, I do not believe these examples come under the head of true transferred reflexes such as are presented in the case of L. J. In him the patellar tendon was stretched and struck fairly with the rubber hammer so that no diffused jarring resulted, as might have occurred had the patient been extended upon a bed. The fact of the uniform crossed-results points to the certainty of a primary localized peripheral irritation of the centripetal conductor, and a secondary stimulation of a motor

[1] "The Diseases of the Nervous System," vol. 1, p. 153.

centre in the opposite side of the cord. In his case there were no crossed "periosteal" or "fascial" reflexes, and, no true transferred tendinous reflexes in any other part of the body.



AC, AC, cells of anterior horns. M, M, motor conductors. I, I, inhibitory centres. PD, PD, degenerated pyramidal columns. S, S, posterior fibres terminating in skin. DT, DT, direct tendinous fibres. CT, CT, commissural tendinous fibres.

Whether the transfer of the excitation in this case is due to some anomalous anatomical arrangement of the sensory fibres of the cord, or to some unusual location of the lesion, I am unable to say. I believe, however, that other examples may be found when the tests are uniformly made. Heretofore most observers have tested the patellar-reflex by making the patient cross his legs; or one extremity has

been tested at a time. If both legs are suspended, it is possible that transferred reflexes may be detected, more frequently than they now are, and I have had constructed, for the purpose of determining the absence or presence of the patellar tendinous reflex, a small support of T shape, with a firm base, upon which both thighs may be placed. This is a convenient apparatus in many ways, and of great service when the patient happens to be a corpulent person.

It is very probable that more fibres of the external fasciculi of the posterior nerve-roots pass forward and decussate than we have any idea of; or that the internal group of large motor cells receives sensory connecting fibres, which may sometimes be in excess of the direct fibres. Whether L. J. always presented the crossed-reflex in health is not known. It may be assumed, however, that either through disease of the direct centripetal sensory fibres in that part of the cord from which the second, third, and fourth lumbar nerves arise, or an anomalous development of the crossed fibres, the peripheral stimulation is carried across the cord, and as the inhibitory influence coming from both lateral columns is abolished, the motor discharge may proceed from the cells in either anterior horn. The accompanying plate is intended to show the course of the commissural fibres of the external fasciculi and their cell-connections.

EDITORIAL DEPARTMENT.

In the death of Doctor J. Marion-Sims we all have lost a friend of rare professional and gentlemanly qualities. Eulogies are useless when offered in memory of a man so well known, so widely respected, and so universally loved, as he. Sympathy for his family and honor for the departed will be the tribute of two hemispheres.

R. W. A.

NEW BOOKS AND INSTRUMENTS.

A Practical Treatise on Impotence, Sterility, and Allied Disorders of the Male Sexual Organs. By SAMUEL W. GROSS, A.M., M.D. 8vo, 176 pp. Henry C. Lea's Son & Co., Philadelphia, 1883.

The former edition of the first work was reviewed in this journal, October, 1881, but, contrary to custom, it is again noticed because of its excellence, and to contrast it with a recent work on a kindred subject.

Impotence is studied under the subdivisions of atonic, psychical, symptomatic, and organic impotence.

Sterility is subdivided into that caused by azoospermism, aspermatism, and misemission, while the book concludes with chapters on spermatorrhœa and prostatorrhœa.

The work throughout bears the marks of extensive reading, a large experience, a truly scientific spirit, and an arrangement of the material at hand in a systematic, book-like way.

After a brief introduction on the mechanism of erection, each ailment is taken up and disposed of in its etiological, clinical, pathological, diagnostic, prognostic, and therapeutic aspects, thus making it in truth a treatise. The separation of these subdivisions into paragraphs, headed by capitals, the abbreviation of cases and their relegation to separate paragraphs and smaller type, and the introduction of sixteen cuts, most of them original, all tend to make the work an instructive text-book.

It is not strange that the book should have a surgical tone when the author has seen *one hundred and fifty-nine* cases of atonic impotence due to inflammation or hyperæsthesia of the prostatic portion of the urethra, and only *twelve* due to diminished or abolished reflex excitability of the prostatic portion of the urethra.[1]

[1] Page 21.

Psychical impotence must needs be rare when a man of Professor Gross' experience has seen but one case, which he narrates.[1]

From researches first published in 1877,[2] and from his subsequent experience, he concludes (and he backs up his conclusions with records of careful urethral examinations) that impotence is very often due to morbid sensibility and subacute inflammation of the prostatic urethra often associated with stricture. He affirms that stricture and gleet are often caused by masturbation, and cites five cases, in which the idea of an antecedent gonorrhœa must be discarded, to substantiate his affirmation. In Professor Gross' one hundred and fifty-nine cases of atonic impotence, one hundred and forty were examples of feeble erection and premature ejaculation, fourteen had lost the power of erection but retained the desire, and five had lost both power and desire. The author's line of treatment is moral, hygienic, surgical, medicinal, and in every way sensible, occupying seventeen pages of the book; it will be referred to later.

Of psychical impotence he says little, having seen but one case himself. He calls attention to many cases which would be thought to be psychical impotence did not a careful examination reveal a sensitive urethra. He says:[3] "I have dwelt somewhat at length upon the erroneous diagnosis which is usually made in cases of so-called psychical or nervous impotence, in order that I might call attention prominently to the importance of examining the urethra in all examples of impotence, since the prognosis is far more favorable when the trouble depends upon hyperæsthesia of its prostatic portion, than when that condition is absent. Had this precaution been observed by many writers on the subject, they would have been able to give a less gloomy account of psychical impotence, and have said less of the importance of gaining the patient's confidence, and of the moral treatment adapted to each case."

Section V. contains a discussion of organic impotence, from abnormal conditions of the penis and testes. A very terse but full presentation of the subject.

The remaining subjects—sterility, spermatorrhœa, and prostatorrhœa—are handled in the same methodical, scientific way, but as they bear little upon the subject in hand,—impotence,—no further notice of them will be taken.

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[1] Page 61.

[2] *Med. and Surg. Reporter*, May 5, 1877, p. 391.

[3] Page 63.

Professor Gross' book is, as its name indicates, a treatise, concise, systematic, scientific, and sensible. It is a book for physicians and students only, and holds out no temptations to others than one in want of a plain scientific exposition of pathological therapeutical data. To the seeker after prurient literature the book is a poor investment, for the cases reported are few, shorn of their disgusting details, and couched in the plainest and most *un*-sensational language.

Professor Gross is, without any doubt, actuated by the same manly feeling as his fellow-townsman, Goodell, when he said to his clinical class, on approaching the subject of masturbation in the female : "For the correct interpretation of diseases we must intrepidly search out their causes, whether moral or physical, however loathsome or impure they may be. . . . It is, however, so hard a task to discuss such subjects in acceptable language, that I confess to some squeamishness, and would much rather refer you to suitable text-books, were there any. But, unfortunately, there are none on these subjects, although our land is flooded with a prurient literature treating of the conjugal relations. Impudent quacks and men of battered reputations must not be your guides, far better it is for you to learn a new thrust of fence from a friendly foil than from the stab of a foe."[1] [R. W. A.]

Sexual Impotence in the Male. By WILLIAM A. HAMMOND, M.D., Surgeon-General U. S. Army (retired list) ; Professor of Diseases of the Mind and Nervous System in the New York Post-Graduate School ; President of the American Neurological Association, etc., etc.

It was my intention to review this book, but, as a careful perusal proved it nearly as barren of valuable scientific material as a summer novel, I desist.

Two thirds of its pages are given up to the almost uninterrupted introduction of cases, many of them narrated with an astonishingly unnecessary minuteness of disgusting detail.

[R. W. A.]

Insanity Considered in its Medico-Legal Relations. By T. R. BUCKHAM, A.M., M.D. Pp. 265. J. B. Lippincott, Philadelphia, 1883.

Dr. Buckham's book is intended for the reformation of legal medicine, and we are told in the preface that it is the author's

[1] "Clinical Lessons in Gynecology" (see *Am. Jr. Obstetrics*, etc., etc., May, 1883, p. 450).

aim to advance the so-called "physical media" theory of insanity. He, however, treats his subject in no new way, and there is little to be found that is not contained in any of the various standard works upon forensic medicine. In many respects the volume reads like one of the essays which emanate from either of the local societies of medical jurisprudence, and it would have been of far greater value had the author followed more closely the teachings of modern psychiatry. Notwithstanding its conventionality, it presents much that is attractive, and there is a vein of rigorous criticism which must meet with the approval of all who have occasion to go into court. Dr. Buckham calls attention to the crude legal tests of insanity by which real disease is so often overlooked, and to the stupidity of courts of law who consider the mind as something that may be collected in a bell glass and analyzed at leisure. He very carefully points out the errors in the various rulings which are so often quoted, the insufficiency of the venerable "right and wrong" test, and brings forward many pertinent cases to support his views.

His chapter upon experts is quite full of suggestions, some valuable, and others quite impracticable. He has an all-abounding faith in the acquirements of the superintendents of asylums, and is disposed to believe that outside alienists do not make good experts. There is some truth in this, but every day brings the conviction that insanity is being studied outside of asylums in a more thorough way than it ever has been before, and there is a large body of energetic men who are delving into the neglected fields of cerebral pathology, and doing much which must place them ultimately upon the same, if not a higher plane, than that at present held by most of the medical officers of asylums.

Dr. Buckham dwells upon the shortcoming of the expert system, and we entirely agree with him when he says that the courts are disposed to listen with the same attention to the testimony of the non-expert and that of the man of experience. In New York at least, and it is doubtless so elsewhere, any medical nomad may go upon the witness-stand and claim to be an expert. In one court his expertism lies in the direction of broken legs, in another it is "spinal concussion," in a third it is "gynecology," and again it is insanity. Judges are too apt to cast contumely upon expert testimony as a whole, because educated men and impostors are pitted against each other. His suggestion for the institution of a commission would do away with much injustice if such a one

were appointed and its duties properly defined. According to Buckham the expert should give his services without expectation of reward, and be prepared to hold himself in readiness to be called to any part of the State in which he lives. We know of no fully qualified medical gentlemen outside of the asylums, who would give up their practice and go upon such a quixotic errand. Even those alienists in charge of institutions who are under salary would demur at this unremunerative use of their brains.

[A. MCL. H.]

Types of Insanity. An Illustrated Guide to the Physical Diagnosis of Mental Disease. By ALLEN MCLANE HAMILTON, M.D. Wm. Wood & Co.

This work comprises thirty-six pages of printed matter and ten plates. Nine of the plates are to illustrate the facial expression, attitude, etc., of the insane.

The following conditions are illustrated : Idiocy, imbecility, melancholia attonita, chronic melancholia, subacute mania, chronic mania, two cases of dementia, one case of general paralysis.

All that can be said of these plates is that they are very poor. The instantaneous photographs which the author tells us the plates were drawn from were probably good, but in their transfer they have undoubtedly lost very materially. In the plates you see no well-marked lines of facial expression, as are so often seen from the contraction of certain facial muscles. It is strange that there are so few illustrations of types of facial expression, attitude, etc. Two large asylums like Ward's Island and Blackwell's Island must contain ample material for illustrating every type and all varieties of facial expression. We find no plates to illustrate agitated melancholia (melancholia agitans) or monomania ambitious, mégalomanie (Dagonet). Each plate is accompanied by a page containing a very short description of the case. It is unfortunate that these histories and descriptions are so very imperfect; it would have added much to the usefulness of the work if a concise description of the case, the clinical history, and the distinctive features of the type—mental as well as physical—had been given.

The text, consisting of thirty-six pages, is divided into five chapters, treating of the following subjects :

Chapter 1: On the general appearance of the insane—physiognomy, posture, conformation of the head, etc.

Chapter 2: Condition of special organs—the eyes, the ears, the mouth and teeth, the tongue, the nose, etc.

Chapter 3: On the condition of the bodily functions—the circulation, the temperature and pulse, variations of the skin and its appendages, muscular tonus, the reflexes, sensibility, the urinary secretion, menstruation, etc.

Chapter 4: Examination of patient, changes in dress and personal habits, etc.; the handwriting of the insane.

Chapter 5: The commitment of the insane; abstract of the laws of the various States.

The subjects in each one of these chapters is treated in a very general manner and very briefly, and is not arranged in such a manner as to bring out prominently the connection between these physical symptoms and the types of insanity. This appears to me a defect, for when reference is made to the title of Dr. Hamilton's work it would seem that his object has been to aid his readers in arriving at a diagnosis of the types as far as that can be done by the physical signs alone. To illustrate what is meant a few lines will be quoted: "The condition of the skin and its appendages is worthy of study. The cutaneous surface is usually dry, harsh, and presents evidences of malnutrition. In rare instances there is profuse sweating, notably in acute mania; but the action of the sweat-glands is feeble. In some forms of disease, acne, herpes, and certain bullous eruptions play a crisogenic part, and disappear after each exacerbation." There is also another disadvantage in his arrangement. If one desires to learn the physical symptoms associated with melancholia he has to read the thirty-six pages, and finds what there is on the subject scattered through the work.

The expression "sexual insanities" appears several times in the work, whatever is meant by that.

In recent times there is apparently much activity in the study of mental diseases, if one can judge by the works which have appeared on the subject within the past six months. This may be the beginning of an active interest in the scientific study of these diseases in America, which has heretofore been so far behind other countries. This dawning activity should be encouraged, and whatever criticism is offered of these works and what appear to be defects pointed out, is done with the idea of stimulation, and not derogation, of the work; and it is to be hoped that works like Dr. Hammond's and Dr. Hamilton's will do much toward creating an interest in the study of these diseases.

The idea of a portfolio of plates to illustrate the types of insanity is a good one, and, in spite of what appear to me defects, it will doubtless prove useful to physicians. [J. C. S.]

The Principles and Practice of Surgery. By D. HAYES AGNEW, M.D., LL.D., Professor of Surgery in the Medical Department of the University of Pennsylvania. Vol. iii, pp. 784. Lippincott & Co., Philadelphia, 1883.

This is the final volume of this work, the first of which was issued in 1878, and noticed in these ARCHIVES in February, 1879.

It contains chapters 24 to 37, and treats of the surgery of the trachea, nose, eye, ear, skin, nerves, mammary gland, lymphatic system, and muscles; of syphilis, deformities and malformations, tumors, electricity in surgical therapeutics, and massage. We note, in passing, the use of the word *orthopœdia* in a new sense,— to indicate a class of diseases, as "the treatment of orthopædia," a use which is to be deprecated as unnecessary and conflicting.

This volume shows the same thoroughness and attention to detail which characterized the first two, and which make the completed work the largest and fullest treatise on surgery in our language that has come from the pen of a single author. Large and full as it is, however, it must still rank as a compendium, and although some of its sections are veritable monographs, with a fulness of detail and statistics to which nothing could be added, yet on most subjects the surgeon who wishes for more information than that which is directly needed properly to treat a given case, must still turn to special articles or books, or to those voluminous works by many hands which are now issuing from the presses of Europe and America. An idea of the fulness with which the different topics are treated, may be obtained from the following comparisons: the chapter on Diseases and Injuries of the Blood-vessels occupies about two thirds of the space given to the same subject in the American edition of "Holmes' System of Surgery"; the chapter on Fractures nearly two thirds of that in Hamilton or Stimson; and the chapter on Syphilis nearly three fourths of that in Van Buren and Keyes. For most practical purposes it is sufficiently full and detailed to serve the general practitioner as well as a small surgical library.

Detailed notice of the treatment of the different subjects is here impossible, and it would be unfair to the author and unpleasant to the reviewer to seek out for disapprobative mention, where there is so much to commend, those items of omission or com-

mission on which their judgments differ. And while perhaps no one has the right publicly to question the propriety of another's choice of work, we may be permitted to express the opinion that the industry, learning, careful observation, and large experience shown so constantly in this book, and to which we have already borne testimony, would have produced results of higher value, would have more advanced the science of surgery, if the author had limited his writing to fewer topics. But he has chosen differently, and he has produced a work which will always be valuable to its possessor, and will long remain an honorable monument to its author. [L. A. S.]

The Treatment of Wounds as Based on Evolutionary Laws. By C. PITFIELD MITCHELL, M.R.C.S. New York: J. H. Vail & Co., 1883.

In this brochure of twenty-nine octavo pages, the author seeks to develop the argument of a previous essay—that in the Spencerian doctrine of evolution is found a guide to the treatment of wounds inflicted in the operations of surgery. Through a discussion, to which we must refer the reader, he arrives at the conclusion, that the system of Lister is philosophically wrong, and that drainage tubes, ligatures, etc., are prejudicial to the healing process. His is the "cleanliness" plan, with disregard of the atmosphere as a morbific agent. The road which the author has taken may not be to our judgment; but it is certain that he has reached a truth which, to-day, encourages and emboldens the surgeon, and crowns his work with success. [J. V. D.]

The Roller Bandage. By WILLIAM BARTON HOPKINS, M.D. 12mo., pp. 95. Philadelphia: J. B. Lippincott & Co., 1883.

The object of this little book is to teach, by drawings from photographs and by brief text, the art of applying the roller bandage. Since so much of the intended instruction is expected of the pictures, we can only wonder why such poor specimens of the pictorial art were thought worthy for such service. We believe the art of bandaging can be learned from this, if from any, book, but of this the best evidence is in the experiment. [J. V. D.]

The Treatment of Wounds. By LEWIS S. PILCHER, A.M., M.D. 8vo., pp. 391. New York: William Wood & Co., 1883.

Books on the treatment of wounds need no apology for their

appearance. The subject has reached such vast proportions, by such rapid strides, that the frequent appearance of works of the character of this is to be looked for. Well-grounded principles furnish a scientific basis for the methods of wound-treatment. The treatment of operation-wounds has attained a success which gives the operator unlimited boldness and adds to his triumphs. This book is divided into two parts, which treat, respectively, of The Principles and Practice of Wound-Treatment, and of Special Wounds. There is throughout the strictest enforcement of the rules which had their origin in the acceptance of the germ-theory of disturbance in the healing process. Hence, the investigations which relate to micro-organisms, asepsis and antisepsis, and wound-disinfection are fully set forth in as many chapters. Full tables are given, which show the relative value of germicides ; and many pages are devoted to the discussion of corrosive sublimate, carbolic acid, subnitrate of bismuth, naphthaline, iodoform, etc. The author seems to accept the more advanced and recent beliefs in this department. His facts are the most recent in this as in the rest of the book, and the matter is well arranged. We could have wished that there was less reading to do, and that there was less reference to authorities by long and frequent quotations. The illustrations, one hundred and sixteen in number, are generally apt and fairly executed. The book belongs to Wood's Library of Standard Medical Authors. [J. V. D.]

The Dispensatory of the United States of America. By Dr. Geo. B. Wood and Dr. Franklin Bache. Fifteenth edition. Rearranged, thoroughly revised, and largely rewritten, with illustrations. By H. C. Wood, M.D., Joseph P. Remington, Ph.G., and Samuel P. Sadtler, Ph.D., F.C.S. Phila.: J. B. Lippincott & Co., 1883. Pp., 1928.

A book of truly terrifying dimensions, and a perfect storehouse of chemical, botanical, and pharmacological facts of real scientific worth.

Its purely medical part, *i. e.*, the text under the heading "medical properties and uses," is the minor part, and this fact together with the bulk of the work will prevent its general use as a text-book. As a book of reference, it remains, as it always has been, invaluable. The physiological and therapeutical paragraphs have certainly brevity to recommend them, and this is a good deal, after seeing what an amount of space is given in some text-books to the almost endless discussion of questions which cannot be decided.

Among the references the almost entire absence of recent dates is very apparent. One can only infer from this that the work of revision is perhaps not quite so thorough as it might have been.

On page 124, last line, this rather remarkable statement appears : "It is very plain that so uncertain and powerful a remedy [aconitia] ought not to be used at all internally, * * *"; and the *internal* use of the alkaloid in the treatment of neuralgia or *any* disease is not mentioned.

The word stasis for status, on p. 187, is undoubtedly an oversight. The doses of conium and its preparations, p. 487, seem ridiculously small—.20–.26. Hardly enough credit is given to the truly remarkable effect of viburnum in some cases of dysmenorrhœa, p. 1522.

Among the many excellencies of the work there are some glaring defects, and the most conspicuous and disheartening of these is the neglect, total in some places, of the metric system of weights and measures, and frequently of the centigrade thermometric scale.

At best the intention throughout is to make the metric system of secondary importance; its figures following those of the old system in brackets. In many places, as p. 1226, sixth line; p. 1227, twenty-first line; p. 1228, nineteenth and twenty-third lines, no metric equivalents at all are given; and the simplicity of translating from one system into the other is obscured by the frequent use of such clumsy numbers as 1.95 and 3.9 as the metric equivalent of one half and one drachm respectively.

The care with which the compiler of the pharmacological part of the book translates the metric weights and measures of the new pharmacopœia back into ounces and grains, without even giving the metric equivalents, is absurd, and relegates this part of the work to the dark ages.

The tone of such a work as this should be that of progress, not of blind conservatism.

The two hundred and twenty-four pages devoted to "drugs and medicines not officinal" form a sort of cyclopedic addition not devoid of interest or usefulness.

The twenty-nine pages closing the book comprise analyses of mineral-spring waters in this country and abroad, which are of great value. [R. W. A.]

A Practical Treatise on the Medical and Surgical Uses of Electricity. Including: Localized and General Faradization; Localized and General Galvanization; Frankliniza-

tion ; Electrolysis and Galvano-Cautery. By GEO. M. BEARD, A.M., M.D., etc., and A. D. ROCKWELL, A.M., M.D., etc. Fourth edition, pp. 760. Revised by A. D. Rockwell, M.D. With nearly 200 illustrations. New York : Wm. Wood & Co., 1883.

To this fourth edition of "The Medical and Surgical Uses of Electricity," which we now have before us, very nearly the same remarks may be applied as those which followed the appearance of its predecessor.

To begin with, the book is altogether too voluminous to be of practical use to students and general practitioners ; perhaps it is better fitted for reference.

This enormous volume is divided into four parts, of which the first, treating of electro-physics, contains six chapters. The first chapter of this part is principally devoted to showing that "a knowledge of the principles of electro-physics is necessary to the electro-therapeutist" ; it also gives the definition of electricity and magnetism. Chapters II. and III. respectively treat of statical and voltaic electricity. In Chapter III., as an example of time and space wasted, we shall note that, while giving the early history of galvanism, our authors express themselves as follows :

"On observing this, it occurred to him [Galvani], that perhaps he had found a means of detecting atmospheric electricity more delicate than he had previously employed. In order to test this, Galvani took the dish of frogs, and, with his neighbor Camillo, went out on the terrace of his house. It was a clear evening in the early part of September, and no marked electric phenomena were apparent in the air. Fixing an iron hook in the spine of each frog, he suspended it from the iron railing.

"*Behold, spontaneous movements appeared in the frogs, various in their character and quite frequent!*" Besides, in a foot-note, the following : "At No. 96 in Strado S. Felice, Bologna, the house where Galvani lived, with terrace and railings, is still shown to travellers," (p. 42). Doubtless it is superfluous to remark that, however impressive this narration may be, it might have been left out with great advantage ; this, especially in a work which at each step professes to be strictly scientific. Chapter IV. treats of electrolysis, and in Chapter V. special notice is given to induced and thermo-electricity. Here again too much time is given to the description of induction, and while speaking of induction coils and electro-magnetic machines, there is so much repetition as to have led us to think of those books specially arranged for the teaching of children. At the same time we have also to deplore

that such short notice should have been given to thermo-electricity. At the present time, when every one is striving to secure exact measurement in scientific works, it is at least curious to see how the different kinds of measure are indiscriminately used, side by side, in the present volume. Thus, in one and the same page we read : " It is about fourteen inches in length (Ruhmkorff's coil). The inner coil is of copper, is about 2 mm. in diameter, and four or five yards long." A book which embodies so much pretention ought to be more precise.

Ohm's law and its practical application to electro-therapeutics, opens and closes Chapter VI. Eighteen full pages are used to show that : " Just as the strength of the theory of gravitation consists in its power to account for the movements of the solar system, just as the strength of the undulatory theory consists in its power to explain the complex phenomena of light, so the strength of Ohm's law consists in its power to account for the phenomena of dynamical electricity."

The second part of the work is divided into eleven chapters.

The relation of electro-physiology to electro-therapeutics begins Chapter I. of this part. Under the heading : "*Importance of a knowledge of electro-physiology to the electro-therapeutist*," the authors rightly blame those who, in every-day practice, hold two sponges on the body of their patients, regardless of pole or position, quality or quantity. In Chapter III., which deals with electrotonus, after exposing at some length the peripolar arrangement which forms the basis of Dubois-Raymond's theory of electrotonus, a short notice is given to Pflüger's contraction law. The experiments by means of which Cyon succeeded in producing electrotonus in the nerve of living man are also mentioned. But those beautiful and most scientific experiments of Waller and de Watteville have been passed over in silence. This fact is rather surprising, and is, at the same time, to be regretted, as it appears that, notwithstanding the chaos which surrounded the phenomenon of electrotonus of nerves in man, Waller and de Watteville have been able to find their way to the most delicate and conclusive deductions. In such a review, it would be out of place to detail the method followed by these experimenters ; besides, to lay down the results arrived at, would require too much space ; we shall, therefore, have to refer the reader to their original works.

In Chapters III. and IV., the action of electricity on the skin, the brain, and spinal-cord is treated. It is impossible to follow the authors on this ground as it would occupy too much space ;

it will suffice us to state that the action of electricity on these parts is not as yet clearly understood.

The action of electricity on the sympathetic and pneumogastric is considered in Chapter V. Here we must stop to examine the results obtained by our authors. First, it is stated that "in external applications, it is the *derived* currents that pass through the nerves, and direct *polar* effect is not gained. . . .

"In our attempts to solve the problem, we have experimented on a large variety of individuals of different ages and by different methods of application. One of the electrodes is placed in the mastoid fossa, and the other over the seventh cervical vertebra, or at the top of the clavicle. Both directions of the current are used. We used in these experiments a zinc carbon, or the Smee's battery of from five to thirty cells, from one to five or ten minutes. The general results of our researches may be thus summed up:

"1. *A slight feeling of drowsiness*," perceptible either shortly after the application of the electrodes, or not until the lapse of five or ten minutes after the *séance;* the results were not constant.

"2. *A feeling of warmth through the system with sensible perspiration*." (It is not stated whether the experiments were performed in warm weather or in a hot room.) Yet the symptom was not constant.

"3. *A marked effect on the pulse*." Although the pulse was usually "lowered two, three, four, or more beats," it "was sometimes accelerated."

The "effect on external electrization through the neck on the retinal circulation," as verified by the authors and ophthalmologists, was as follows:

1. Galvanic or faradic currents being used on the sympathetic, contraction of the arteries or dilatation of the veins followed.

2. Faradic currents produced the same effect as the galvanic on the retinal circulation; only this effect was produced more slowly with the faradic current.

3. The blood-vessels contracted under the influence of mild currents and short applications; strong currents and long applications produced dilatation of these vessels.

4. In patients under certain influence,—as nervousness, etc.,—mild currents at once cause dilatation without previous contraction of the vessels.

5. The contraction is sometimes followed, a few minutes after the application, by dilatation greater than normal.

"6. The dilatation which takes place is sometimes followed by contraction after the close of the *séance.*"

Considering the very rough way in which these experiments were made, it is scarcely necessary to state that they are unacceptable. Indeed, the evidence of contradiction with which all these conclusions are marked is too striking to need comment; yet the lamentable errors upon which all this depends might have been easily avoided. To discriminate between the use of the two poles and the seat of their application is an elementary fact with students in electro-therapeutics. Yet, in the present experiments, these poles are applied on the subject experimented upon indiscriminately; there is no indifferent electrode, both are active at the same time and almost on the same point! Among the many fruitful causes of error with which we have to deal while experimenting in electro-physiology, this indiscriminate use of the poles may be ranked first. Now, with such facts before us, our experimenters would lead us to believe that in these cases there was an anæmic state of the encephalon, and that this diminished current of blood was caused by electrization of the sympathetic in the neck! No proof, however, no explanation even, is offered.

In placing one electrode in the "mastoid fossa," and sending through it an electric current to the underlying tissues, it is surprising to know that this current had acted on the sympathetic only. It is just as if the current used had been sent with a special mission to affect in such and such a way only this or that nerve among many, leaving the others untouched.

On the other hand it is scarcely surprising that these experimenters should have obtained results so contradictory in the same experiment. As we have already pointed out, the position of the poles, the polar effect, the direction of the current, are facts of no little moment, and that in the present case have not been sufficiently dealt with. Doubtless the augmentation as well as the diminution oftentimes noted in the beats of the pulse might find an explanation in this lack of precaution. One of the poles being applied on the seventh cervical vertebra, the other in the mastoid fossa, it is clear that both the spinal cord on the one hand and the pneumogastric sympathetic on the other are excited at the same time; hence the effect of the more active of the two poles will be apt to show itself at the expense of the less active pole. Let us suppose, for example, that the kathode is in the "mastoid

fossa," and that it is the more active of the two poles ; it is probable that its effect in this position will affect the nerves underlying it. Now let it be placed on the spinal cord : in this new situation it will affect this organ at the expense of the anode which is the less active of the two poles ; hence, with the same electrode (*pole*) in different situations different effects are produced in the same organ. As for the after-effect of the current on these nerves, they might find an explanation in the very ingenious experiments of de Watteville and Waller, mentioned above.

Chapters VI. to XI. need not detain us at all. It will suffice us to mention that the nerves of special sense, motor and sensory nerves, muscles, etc., etc., and especially their reactions to electricity, are treated of.

Electro-therapeutics opens Part III. of this volume. As the space allowed us is limited, we shall not be able to devote much time to this part. A few points, however, need mentioning.

For example, in Chapter III., while speaking of the "differential action of the poles," it is stated : "It has specially been shown that the *anelectrotonic* region at the positive pole is in a condition of diminished, while the *catelectrotonic* region near the negative pole is in a condition of increased, irritability." This is a rather misleading if not incorrect statement.

It is known that (providing the polarizing and the exciting galvanic currents run in the same direction) both the kathodic and anodic closure excitations are greater in a nerve under the influence of the kathodic polarization than when in its normal state ; at the same time that the kathodic and anodic opening excitations produce less effect in the nerve than before polarization. We know also that for the prompt and unequivocal production of the phenomena, both the exciting and polarizing stimuli must traverse the nerve, as nearly as possible, at the same point ; it is to answer this purpose that de Watteville and Waller have devised to make both the stimulating and polarizing currents to pass through the same electrode. These experimenters have explained the above modifications taking place in an electrotonized nerve, by the creation of two electrodes of opposite name.

For example, let us suppose a *real* electrode, representing at the same time both the polarizing and the exciting kathodes of two galvanic currents. Now, if this *real* electrode be placed on the skin, as near as possible to an underlying nerve, at the passage of the polarizing current this nerve will be affected in such a way that it will have to suffer the influence of two currents of

opposite name at the same time. In that part of the nerve immediately underlying the skin will arise a *virtual* polar electrode of the same sign as the real electrode, while, owing to the rapid diffusion of the current, another electrode of the opposite sign will be formed all around the nerve; this electrode has received the name of *virtual peripolar* electrode. This disposition explains why, in the present case, the kathodic region is not *near*, as is stated in the work before us, but at the pole itself. In other words, in the present case, it is the *virtual polar* electrode which is in the kathelectrotonic region; while, on the contrary, the *virtual peripolar* electrode is in the anelectrotonic region, *i. e.*, in the region around or *near* the nerve.

In this same chapter, much stress is laid on the differential effect between current direction and polar application; yet the authors state that although the effect depending upon current direction is not "impossible," nevertheless, "if it be not entirely a myth, it is, to say the least, undemonstrated."

Here also we read that the liver, the stomach, the spleen, etc., when in a pathological state, can be easily affected by general faradization. Indeed, that general faradization affects these organs so easily, that it may assist us in determining the locality of certain of their diseases, if not their nature.

Now we come to the interesting chapter on electro-diagnosis. We notice that the questions relating to electro-muscular sensibility and contractility receive but little notice.

The following are given in order, as representing the law of contraction in normal muscles and nerves: 1. C. C. C.; 2. A. O. C.; 3. A. C. C.; 4. C. O. C. It is seen that the anodic opening contraction exceeds the anodic closure contraction. This statement, although partially correct in itself, however, would not stand rigorous tests, for this fact can be easily verified, that An. C. C. is most frequently equal to, if not greater than, A. O. C. We have seen above that with both the kathodic and anodic polarizations, the *anodic closure contraction is augmented*, while *the reverse is the case with the anodic opening contraction.* This reaction ought to be always kept in mind while testing normal muscles and nerves. One fact, however, will startle those who are somewhat familiar with the pathology and electro-diagnosis of bulbo-spinal diseases, and consequently deserves special mention.

Among the illustrative examples of diseases in which the reaction of degeneration is usually obtained, the authors have classed progressive muscular atrophy with traumatic paralysis of nerves,

lead paralysis, infantile paralysis, neuritis, etc. To those who have seen and examined electrically a case of progressive muscular atrophy, it is scarcely necessary to state that this stand-point is not tenable; on the other hand, we feel that we cannot too strongly warn students against expecting to gain reaction of degeneration in such cases. It is generally known, indeed, that in the great majority of *true* cases of progressive muscular atrophy (perhaps in all) the reaction of degeneration is not present; even faradic reaction is not lost, so long as there are sufficient muscular fibres left to answer the stimulus. Nevertheless, we do not forget that at a certain stage of the disease, toward the end, the reaction as excited by faradism may become slow, and sometimes vermicular, as if the muscular fibres reacted but reluctantly to the stimulus. This fact, which depends on the quantity of muscular fibres affected, and which is of the greatest importance, considered in a diagnostic point of view, is not to be assimilated, however, with the so-called *degeneration of reaction.* In spite of Erb's contradictory statements, we maintain that the change, in progressive muscular atrophy, as far as can be made out at present, is quantitative, but not qualitative, as those that may be present in the other diseases with which it has been erroneously associated.

The other chapters treat, respectively, of apparatuses and the way of using them, localized and general faradization, localized and central galvanization. The preference is given to general faradization and central galvanization over the local applications, and we learn that the best results registered by the authors have been obtained by the alternate use of these methods. However, it is with much pleasure that we note that the clumsy and unsafe method of galvano-faradization formerly used by the authors has been done away with.

In the chapter on static electricity it is seen that, in general, dynamic electricity is more valuable than the franklinic; nevertheless, in certain diseases, it is the belief of the authors that the latter is superior to dynamic electricity. Among such cases may be mentioned locomotor ataxia and systemic diseases of the spinal cord.

Chapters XV. to XXXVIII. are occupied with the relation of a multitude of cases (196) of all sorts of disease, most of which have either been cured or improved. It is truly painful to see 252 pages sacrificed to the report of badly recorded cases. To those students and general practitioners who will have to deal

with these cases we tender our sympathy; for should they ever have to consult them for reference, or to elucidate some obscure case, they will certainly feel more embarrassed after the consultation than before. These cases are so arranged as not to allow of distinction between one disease and another. At the present time, when so many good treatises exist on almost every pathological state, it is a lamentable mistake for authors to strive to illustrate and enlarge their books with cases that have but a remote relation with the subject of their work; it is more than this—it is confusing, misleading!

The fourth and last part of the book treats of electro-surgery. Here some of the different kinds of apparatus in common use are described; the subject of electrolysis, especially "electrolyzing the base," receives particular attention.

But perhaps the most interesting chapter in this book is the one treating of midwifery. We all know with how much anxiety we suspect extra-uterine pregnancy, for it has been the lot of all those who have had to deal with this abnormality to expect a fatal end; but here we see the report of seven successive cases treated favorably by electrolysis. To say the least, it is more than we could have anticipated; the profession must feel greatly indebted to Dr. Rockwell, with whom this bold operation originated.

In the chapter on galvano-cautery, after describing the different batteries and instruments in general use, the advantage of galvano-cautery over the actual and potential cautery and the ordinary operations with the knife are discussed. Then follow the rules governing the use of the galvano-cautery; they are too numerous to find room here. Here twenty-seven more cases are reported, making in all two hundred and twenty-four cases (224!). At last the book closes with a chapter on the miscellaneous surgical diseases which can be treated either by simple electrization, by galvano-cautery, or by electrolysis. [C. A.]

A History of Tuberculosis, from the Time of Sylvius to the Present Day: Being in Part a Translation, with Notes and Additions, from the German of D. Arnold Spina; Containing also an Account of the Researches and Discoveries of Dr. Robert Koch and Other Recent Investigators. By ERIC E. SATTLER, M.D. Cincinnati: Robert Clarke & Co., 1883.

This little work gives, in its first five chapters, a summary of the different views regarding the nature of tuberculosis, with full references to the literary sources whence it is drawn, and, as such,

is valuable to any one interested in the historical part of the subject. These chapters are translated from Spina's work, and contain, besides a mere enumeration, criticisms by that author on the work of each investigator that he passes in review.

In the last four chapters Doctor Sattler has brought the subject down to the present date, giving a pretty full account of Spina's investigations of Koch's methods, by which the former claims to have disproved the etiological significance of the *bacillus tuberculosis*, together with Koch's reply to the same.

Doctor Sattler honors Spina by asserting him "to be a most formidable critic and opponent of the theories of Koch"; but if Spina cannot adduce better proofs than he does against Koch's theories, we fail to recognize in him any thing very formidable in the way of destructive criticism.

Spina seems to have been unfortunately inoculated with the spirit of his master, Stricker, who, during the past decade, has occupied himself chiefly in attacking the works of others in a small and carping spirit, and then when his criticisms did not meet with the attention he thought they deserved, raising a wail in the medical papers. Spina's methods, in marked contrast to those of Koch, are not of a kind to inspire with great confidence. They make the impression of having been instituted, not so much to discover the real truth of the subject as to belittle Koch. For our part, they seem to have failed in their object most signally.

[W. M.]

Physical Exploration of the Lungs by Means of Auscultation and Percussion. By AUSTIN FLINT, M.D., Professor of the Principles and Practice of Medicine and of Clinical Medicine in the Bellevue Hospital Medical College, New York. Henry C. Lea's Son & Co., Philadelphia, 1883. Pp. 83.

The work embraces the three lectures on the Physical Exploration of the Lungs delivered last winter by invitation before the Philadelphia County Medical Society. The first chapter, besides the introductory remarks, which include a pleasant sketch of the history of the subject, is devoted to elucidating the methods and results of percussion. The other two lectures deal with auscultation. In these he gives a description of the means employed to produce artificial illustrations of the signs obtained by examination of the lungs in these two ways, which are novel and suggestive.

The writer expresses the hope that he may succeed in showing

that what may be considered a hackneyed subject is one which, at the present time, claims attentive consideration, with reference to a further increase and a more general diffusion of the usefulness of its practical application in the diagnosis of disease. Those who read his book will concede unhesitatingly that he has accomplished his object, and will peruse its pages with the deference due to one who has made so long and so thorough a study of this method of determining thoracic disease.

If he succeeds in hastening the establishment of a uniform nomenclature which will be used by all writers and instructors of physical diagnosis in writing or speaking of the physical signs, he will receive a grateful tribute for having removed what he recognizes, as do all who study the subject, a great obstacle which retards the progress of the knowledge of auscultation and percussion, and limits their practical uses. [G. P.]

Hygiene and Sanative Measures for Chronic Catarrhal Inflammation of the Nose, Throat, and Ears. Sixteen illustrations, second edition. By THOMAS F. RUMBOLD, M.D., Professor of the Diseases of the Nose, Throat, and Ears, in the College for Medical Practitioners of St. Louis, Mo., etc. Medical Publishing Co., St. Louis, 1882. Pp. 190.

The necessity of explicit directions to patients is fully realized by Dr. Rumbold. They are given in the work under consideration with so much minuteness that one can see as if he were present the catarrhal victim who has been to the doctor for relief. He has had instilled into him a perfect fear of draughts and catching cold. If he is bald he wears a wig or a cap in the daytime; whether he is bald or not he puts on a night-cap at night, and insists that all his family shall do the same. He has been made aware that nature has provided the hair as a means of protection to the head, and that she should not be thwarted by the use of the scissors; he will discountenance the long locks of his daughters, and tell them that their massive coils will give them headache and catarrh. He will never have his hair shampooed because his doctor has told him that "it removes every particle of oil from the head, causing the scalp to become dry and full of dandruff, the hair to lose its glossiness and natural color, generally giving it a faded and lighter appearance; and because of the absence of the oil one is more liable to take cold on even a slight exposure of the head to a draught of cool air." He will use at least once a week plain vaseline on his head instead of the tradi-

tional bear's grease. He will wind around his neck a woolen comforter, and have nothing to do with a fur collar. He will wear "pulse-warmers" or wristers in winter. His shirt bands and shirt collar will fit him "so loosely that the four fingers of both hands can be inserted between them and the neck," because constriction of the neck will prevent a free circulation of the blood in the head, and will not only sustain but aggravate any congestion existing in the mucous membrane or other tissues."

In summer he is clad in under-garments of "stocking-knit goods." When the weather grows colder he puts on over these a second suit of thicker material. When the thermometer is at 13° F. he dons a third, and if, in cold weather, he goes on a journey, a fourth is drawn on over the others. These "supplemental suits" may be made, the doctor has told him, "of pure wool, cut and sewed from blue, yellow, white, or gray flannel." If he has shivers up and down his back, he wears a "back-protector," quilted, and half an inch thick.

This patient which we have in mind is of course weakly, so the doctor counsels him not to make a frequent change of underclothing. He may wear the one next to his skin, "one, two, three, or more weeks." The doctor also tells him ablution should not be performed more frequently than the surface of the body requires cleansing, which probably will not be oftener than once in one or two weeks in warm weather, and once in four or eight weeks during the winter. Perhaps it may not be necessary to bathe at all during the cold weather.

Among other practical directions exercise in the gymnasium is spoken of as very desirable, and the necessity, which is illustrated by citing several striking cases, of preserving the temper if one would escape catarrh of the head, is also set forth.

The chapter on the use of tobacco is an interesting one. We have not space to review the seven heads under which he discusses its mental and moral effects, but refer to the fifth as the most original:

"The local effect of tobacco on the mucous membrane of the nose, throat, and ears, is as predisposing to catarrhal disease as is inefficient and insufficient clothing in the case of females."

He supports this statement by a table of 3,546 cases, the number treated by Dr. Rumbold in fifteen years. Up to the tenth year, both sexes being about equally exposed and protected, are equally affected—187 boys to 189 girls. From ten to fifteen, when boys are better clothed than girls, and have not begun

to use tobacco, the proportion was that of two of the latter to one of the former. From fifteen to thirty years, the proportion of females is still great, since with thin clothes they catch more colds than men in spite of their use of tobacco. From thirty to forty, the figures are reversed—seven hundred and forty males, six sevenths of whom used tobacco, to three hundred and seven females, who at this age have married, and learned to take care of themselves and dress sensibly.

As sanative measures, he classes cleansing the nose, for which he recommends snuffing up tepid water with salt, with the head in varying positions so as to reach all parts of the nasal cavity ; and the removal of hardened secretions by use of a catheter nasal douche. The inefficacy of the Weber's nasal douche he illustrates by covering with powdered starch the mucous membrane of both nasal cavities and then using a weak solution of iodine. The discolored portion of mucous membrane shows the greatest height reached by the iodide solution to be the antero-superior portion of the cavity. Aside from not cleansing, it has been Dr. Rumbold's experience in a number of cases that it increased the inflammation of the mucous membrane already involved, and caused irritation of the healthy adjacent tissues. The work concludes with similar chapters on the care of the ears and the teeth. These latter chapters may contain, for physicians not specialists, some useful suggestions.

To those who have not already well-defined views of their own with reference to the hygiene of catarrh,—and that most doctors have, one would be led to believe, from the frequency with which one hears in general society an opinion on the subject quoted, the introductory sentence always commencing, "*Our* doctor says,"—Dr. Rumbold's book will be valuable, since it will fit them out with a very definite and precise theory, which is calculated to appeal to the popular mind, as is evidenced by the fact that the book is in its second edition ; if one has not already been convinced by the account of it which we have given.

[G. P.]

The International Encyclopædia of Surgery, a Systematic Treatise, etc. Edited by JOHN ASHHURST, Jr., M.D., etc., in six volumes. Vol. III. New York : William Wood & Co., 1883.

A compendious article on *Injuries and Diseases of the Muscles, Tendons, and Fasciæ*, by Prof. Conner, of Cincinnati, opens the

volume. Compendious, because the several propositions of this well-explored field are disposed of in a rather summary manner, the histology of the repair of muscular and tendinous matter being wholly neglected. The classification of tenosynovitis is defective, as the terms *acute* and *chronic* alone do not do justice to the morbid conditions, and especially to the practical therapeutic bearings of the question. The suppurating and non-suppurating forms are not kept asunder as they ought to be, and thus the advice as to treatment lacks precision. We find enumerated as preventives of tendo-vaginal suppuration, the omnipresent poultice (more helpful to the surgeon than to the patient), local depletion, elastic compression, and even ligation of the main artery; but that most useful of antiphlogistics, *cold*, is not even mentioned. The chapters on paronychia, felon, and palmar abscess seem to be out of place, and belong rather to a treatise on the diseases of the hand. On the whole, the article is very readable.

The *Injuries and Surgical Diseases of the Lymphatics* receive due attention in a short paper by Edward Bellamy, F.R.C.S., of London. The author is abreast of the times. It seems that a regional enumeration of the surgically most important groups of lymphatics would have afforded Mr. Bellamy a fine opportunity to give the general practitioner some useful hints regarding the diagnosis and treatment of the different lesions of such glands.

The late Dr. John A. Lidell's monograph on the *Injuries of Blood-vessels* is one of the best portions of the volume. The simple, unaffected, yet withal virile style, even pathetic here and there, will impel the reader on and on to the end of the article. Aside from its scientific and practical importance, the surgeon of a humane and philosophical bent of mind must deeply feel the dramatic interest inherent to this matter, and the author's vast personal experience, his consummate knowledge of the literature of the subject, together with an impressionable yet impartial spirit, have enabled him to do full justice to it, and to produce a work that will be forever an honor to his profession.

Lidell did not lag behind the times, but to the last preserved a youthful interest in the remarkable strides taken by surgery in his declining years. To how many, otherwise worthy masters of the art, could he be held up in this respect as a shining example! All important statements of the author are borne out by illustrative cases fortified by reference, thus carrying conviction to the critical mind. The matter is free from pedantry, yet carefully systematized and sufficiently subdivided for easy reference.

Among the chemical hæmostatics the undeservedly neglected oil of turpentine is brought to notice, as being much preferable to the perchloride and persulphate of iron. Any one familiar with the surgical work of our city dispensaries will gladly join in the author's protest against the too frequent use of these preparations. A slight injury to the hand, accompanied by some arterial bleeding otherwise easily stopped by moderate compression, is freely bedaubed with the styptic. The result is a wide-spread phlegmon, disabling the member for weeks or forever.

The treatment of hemorrhage by compression and ligation, torsion, acupressure, and the other known methods is exhaustively considered, the author's sound and temperate judgment serving everywhere as a safe guide. The animal ligature is uncompromisingly accepted and recommended in conjunction with an antiseptic wound-management. The actual cautery and transfusion close the general part of the monograph.

Full of interest are the chapters treating of the injuries of special arteries; they contain a wealth of admirably selected and well-arranged cases under five headings, viz.: punctured, contused, lacerated, gunshot, and incised wounds of arteries. The general practitioner, on whose timely interference in cases of accident life so often depends, will find the perusal of the chapters on lacerated, punctured, and incised wounds of arteries of the greatest usefulness, and replete with the most valuable lessons.

The wounds of veins, their dangers, and their proper treatment, are next disposed of, after which follows a most excellent chapter on the wounds of the large cranial, thoracic, and pelvic vessels. It is recommended here to carry operative interference to the utmost verge of the limits which prudence enjoins, in order to secure the injured vessel above and below the injury. Otis' opinion, that it would be more rational to ligature even the vena cava or the aorta than to stuff the wounds with lint saturated with Monsel's solution, as has been done in more than one mortal hemorrhage, is approvingly quoted. The different forms of traumatic aneurism form the subject of the next chapter. Secondary hemorrhage is exhaustively considered, although nowadays the antiseptic treatment has rendered this bane of old-time surgery a rarity.

The article is concluded by a concise and clear enumeration of the important methods of deligating the several arteries of the human body, elucidated by a series of fine wood-cuts, mainly taken from Sédillot. It may be mentioned as a curiosity that the author distinguishes "Czerny of Vienna" from "Czerny of Hei-

delberg" (page 311), deeming them to be two different persons. The two are identical.

About the same time that this, his last literary effort, appeared, Lidell passed away from among the living. Few of the younger generation knew him ; his death hardly made a ripple on the surface of time. Yet his name will be remembered as long as surgery will live.

Professor John A. Wyeth of New York, contributes a very meritorious article on *Surgical Diseases of the Vascular System.* It begins with phlebitis. The normal histology of the veins is carefully given, as is the behavior of the blood in health and disease of the vessel ; but among the subdivisions of the process, a description of the important suppurative phlebitis is wanting, together with its gross and minute anatomy.

The author shows his powers to best advantage in the chapter on the diseases of the arteries, a field previously cultivated by him with great success, in his " Essays in Surgical Anatomy." It presents the latest phase of research, and is enriched by a number of new and well-done wood-cuts. Endarteritis, especially of the syphilitic kind ; atheroma, not omitting even Weigert's " coagulation necrosis" ; thrombosis and embolism, are lucidly and so explained that the non-scientific reader's attention will not flag on account of a dry verbiage :—a cardinal virtue too often missing in cyclopædic articles.

The value of the part relating to vascular tumors is much enhanced by a tabulated record of eighty-two cases of the deligation of the common, and of fifteen cases of the external carotid, artery. Their evidence throws welcome light on the question of the utility of deligation for vascular tumors. All the safe methods for curing angiomata are duly considered. An excellent chapter on varicose veins concludes the article.

The very special theme of *Aneurism* could not receive a more thorough-going and brilliant exponent than Richard Barwell, F.R.C.S., of London, whose name is favorably known on both sides of the Atlantic. The paper is throughout eminently practical, thus furnishing the general practitioner with just what is most needed,—that is, precise and clear guidance in a given concrete case. The style is a model of strictness and lucidity, and quite free from learned cant. Very interesting are the chapters on the causes of aneurism, the author's views being agreeably independent from the traditional superstitions found migrating from one surgical hand-book into the other.

An instance is the part played by syphilis in the causation of the disorder. Mr. Barwell's position seems here to be impregnable.[1] All important statements are borne out by exact reference, and a large number of carefully selected histories enliven rather than burden the delivery. Two curious cases of acute endarteritis are noted. The description of the symptoms of aneurism, but especially the consideration of the differential diagnosis, are splendid, showing the author's thorough mastery of his subject. Its progress and spontaneous cure complete the natural history of the malady, which thus serves as a rational foundation on which a system of treatment, medical and surgical, may be safely erected. Regarding the former, Mr. Barwell warmly recommends venesction, as an undeservedly neglected aid to produce anæmia and an increased coagulability of the blood.

All the methods of surgical treatment are carefully presented, ligation receiving, as a matter of course, most extended attention. Mr. Barwell's original proposition, respecting the use of the bovine aorta as a ligaturing material, will captivate the interest of every one familiar with the disadvantages of catgut and silk.

Finally, all important forms of aneurism are seriatim gone through, and the selection of the best therapy is carefully, but as decisively as the subject permits, indicated and directed.

Indeed, therein lies the author's main strength.

Mr. Barwell's experience of Davy's lever is not favorable, bruising and inflammation of the iliac vein having been observed after its use.

His greatest interest centres in the burning question of the treatment of the aneurisms of the aorta, and of those at the root of the neck; and his remarks respecting the nature of the different blood-currents within the arch of the aorta, and the practical conclusions, hinted at, not yet drawn therefrom, certainly deserve the most attentive consideration. The author's thorough knowledge of the new and old literature of the subject is apparent throughout.

His painstaking but nowise overwhelming use of statistics is commendable.

Professor M. Nicaise, of Paris, contributes an article on

[1] Rheumatism, but especially chronic alcoholism, are accentuated as very common factors in producing aneurism, and the prevalence of the lesion in England, but foremost in Ireland, as compared with continental Europe, is directly ascribed to the "national love of strong liquor."

Injuries and Diseases of Nerves, very well translated by Dr. I. H. C. Limes, of Philadelphia. With the progress of knowledge regarding neural physiology and pathology, the surgical bearings of this branch of medicine have also undergone a marked change, well deserving the distinction of a separate article. After having become accustomed to the Gallic author's love of pedantic classification, the reader will find in the essay much general information of intrinsic interest.

The phenomena following injuries sustained by nerves are excellently depicted, likewise is neuralgia very well rendered. Nerve-tumors, tetanus, and a general consideration of the different surgical procedures applied to nerves, as there are the suture, elongation, finally neurotomy and neurectomy, close the essay. An article on special neural surgery would be a necessary complement of Professor Nicaise's paper.

The proof-reading was not as carefully done as in other parts of the volume.

Professor Edmund Andrews, M.D., LL.D., of Chicago, winds up the volume with a paper on *Injuries of the Joints*. In spite of its several defects the article will be found readable, mainly because the author has ideas of his own, and knows how to express them. He does not exhibit a wide acquaintance with the newer literature, and thus cannot be said to have compiled all that is valuable of contemporaneous knowledge of the matter in question; but he communicates to the reader his personal experience, which seems to have been extensive, and which, well told, must command interest.

Jarvis' adjuster, a nearly obsolete apparatus, has been much and successfully used by Prof. Andrews, who calls it a most efficient means of treatment in dislocations, and deprecates the neglect into which it has fallen with the profession.

In going through the dislocations of the several joints, the author omits even a mention of the vertebral articulations. In a teacher this seems almost intentional.

Noteworthy is the author's success in curing a case of an upward dislocation of the sternal end of the clavicle (page 655).

Among the symptoms adduced as characteristic of fracture of the neck of the scapula, *lengthening* of the arm is not mentioned: a serious omission.

"Luxatio erecta" of the humerus is absent from among the dislocations of the shoulder; their reduction by manipulation is, "at present much in need of further trial, the evidence of its effi-

cacy being solely based upon the small number of cases reported by the advocates of these methods, *Prof. Henry H. Smith, of Philadelphia, and Prof. J. W. Hamilton, of Columbus*" (!). The experience of numerous foreign surgeons bearing on this matter seems to be to the author terra incognita.

Delightful is the little but unique history of a case in which Dr. Rice, a prominent physician of La Moille, Illinois, having declared a humeral dislocation of eighteen months' standing to be incurable, the reduction of this same dislocation was successfully effected nearly three years afterward by a *blind horse.* The curious will have to look up the original.

Although a sincere professor of the principles of antiseptic surgery, the author neglects the mention of that last resort of the modern surgeon in intractable cases of dislocation, namely, arthrotomy, ocular inspection, and operative removal of the impediments to reduction, eventually exsection of the joint. Volkmann, of Halle, has successfully introduced this line of practice, vastly preferable to the application of great force in attempting reduction of rebellious cases.

Bigelow's valuable contributions to our knowledge of the mechanism and treatment of the functions of the hip are deservedly praised and extensively used by Prof. Andrews, forming one of the best chapters of the article.

En passant, it may be mentioned, that the five or six wood-cuts taken from Bigelow are the only decent ones in the article ; all the others being artistic monstrosities, and sad examples of the draughtsman's incapacity, or of Prof. Andrews' indulgent good-nature.

In discussing the statistics of the injuries of and operations about the ankle joint, it is said (page 710) that in the hospitals of Paris and Vienna "*a fearful mortality accompanies all surgical operations*," a statement entirely incorrect as far as Vienna since 1876 is concerned, where the results vie with those of any clinic. On that score, *our* public charities hold their own against all foreign competition.

"Bone-setting" receives the compliment of a distinct chapter, and well deserves it. Neglectful after-treatment of the numerous injuries affecting joints directly or otherwise has called forth and supplied with material the much-despised bone-setter. The anathema of the profession, even the law were helpless against him as long as he supplied what the educated physician did not offer. Since we have learned not to be content with a "cure" of a dis-

location or fracture, but continue the treatment till the *function* of the member has been reëstablished by means of careful orthopædic management, as breaking down of adhesions, passive and active motion, and massage, we hear less and less of the old-time bone-setter, and even Dal Cin's glory has waned.

Though Professor Agnew's "irritable joint" is mentioned, Brodie's articular neurosis simulating so many other morbid conditions is omitted.

The author's ideas respecting wounds and the effective form of drainage of the knee joint are excellent, and deserve the most extended attention and imitation. His remarks are based on a careful study of the normal anatomy of the joint, and boldly attack and dispel the superstitious fear surrounding this subject in the minds of a large number of physicians.

A rather rambling consideration of gunshot wounds of the joints closes the article, a matter, by the way, disposed of in the second volume, by Professor Conner, of Cincinnati. Herein, also, the statistics adduced are too ancient, and misleading as applied to modern surgery.

It may be truthfully said of this volume that no incompetent author found admittance to its pages. [A. G. G.]

The Pathology and Treatment of Venereal Diseases. By FREEMAN J. BUMSTEAD, M.D., LL.D., etc., and ROBERT W. TAYLOR, A.M., M.D., etc. Fifth edition, revised and rewritten, with many additions, by Dr. Taylor. Philadelphia: Henry C. Lea's Son & Co., 1883, octavo, 906 pp.

The fourth or preceding edition of this work was the joint production of both Dr. Bumstead and Dr. Taylor.

Dr. Bumstead being dead, it devolved on Dr. Taylor to rewrite, revise, or enlarge the book as circumstances should require. This he has done in the present volume, changing and modifying the old material and making additions where required.

It is but just to the former edition to say that its general excellency left little to be asked; hence it is chiefly in additions which bring the work up to date that the present author shows his competency, making it thus really his book, and holding out bright promises for its future.

Two excellent chromo-lithographic plates, delineating various pathological conditions of the penis, chiefly sores, are among the additions, and begin the book.

Many valuable additions are found in the therapeutical part of

the book. Dr. Taylor lays special stress upon the beneficial effect of coca as an adjuvant in the treatment of the later stages of syphilis; simply as an *adjuvant*, not as one of the much-vaunted and ephemeral vegetable specifics, does the author call attention to this drug. He says (p. 873): "It is especially useful in the anæmia and cachexia of the secondary period. Given then, with the mercurial, the adynamic effects of the disease are averted." Again (p. 874): "Indeed, it seems that when this remedy is given mercury can be often used in larger doses, and is more efficacious than when it is not used. * * * As is well known, in many subjects the benefits of treatment are more or less impaired, and often even lost, by reason of the patient's addiction to alcohol. * * * Thus in practice I have often induced patients to cease drinking and to have no craving for alcohol, simply by giving them this agent, at first more frequently and in larger doses, and then, as the craving grew less, the dose could be made smaller." He prefers to give the coca in the form of the fluid extract in 2 c.c. doses with some bitter, as gentian or cinchona.

After reviewing the subject, the author speaks thus about the inoculation of animals with syphilis (p. 480): "The gist of the whole matter is this: That with the secretion of a hard chancre which has been irritated naturally or artificially, chancroids may be produced in animals, and that with the unirritated secretion or with portions of the chancre, we may produce something—perhaps syphilis and perhaps tuberculosis. The question may yet be settled by unprejudiced and enlightened syphilographers, who may or may not need the aid of experienced and dextrous mycologists."

The avoidance of the narration of many detailed cases is commendable, as is also the almost entire absence from the book of any thing to gratify prurient curiosity.

The author's touching tribute to the memory of his former colleague, Dr. Bumstead, is appropriate and deserved.

[A. W. R.]

ORIGINAL OBSERVATIONS.

TWO CASES OF QUININE AMAUROSIS, FROM THE PRACTICE OF DR. C. R. AGNEW AND DR. D. WEBSTER.

By DAVID WEBSTER, M.D.,

PROFESSOR OF OPHTHALMOLOGY IN THE NEW YORK POLYCLINIC.

CASE 1.—Mr. A. G. W., aged twenty-three, student of theology, native of Georgia, consulted us on account of asthenopia on January 17, 1880. He stated that seven years previously he had a congestive chill. Large quantities of quinine, say half a dozen large doses, were administered to him during the night, and the next morning he was totally blind. He is positive that he was unable to discern the light with either eye. This total blindness lasted only three or four hours, and then the sight began to return gradually in both eyes, and the next day he could distinguish objects naturally. He thinks he has never seen as well since as before. He does not remember having experienced any colored vision or subjective sensations of light. He says the physicians gave him the quinine in such large quantities because they thought he would not survive a second congestive chill. The remedy produced the desired effect, for he has not had a chill since.

Right eye, vision $= \frac{20}{30}$, made $\frac{20}{20}$ with $+ \frac{1}{48}$ c., axis 90°.

Left eye, vision $= \frac{20}{40}$; not improved by glasses.

Ophthalmoscopically both eyes are normal, except that there are whitish bands running along the sides of the nasal branches of the left central retinal vein, and the optic disk of the same eye seems to be slightly paler than normal.

CASE 2.—Mrs. V., aged forty (?), came under observation January 13, 1880. Her history was given by her husband, a clergyman, as follows. She was ailing very much through the summer of 1879, having frequent attacks of cholera morbus, un-

til finally, on the early morning of Friday, July 25th, she had a very severe attack of the same, beginning, at two o'clock, with severe discharges, running into watery evacuations, until seven o'clock, when she had violent cramps in the lower leg, ankles, and feet. The feet were placed in hot water—almost boiling;—she was covered with mustard poultices over the whole chest and abdomen, and over the whole length of the spine, for over twelve hours. These were then removed and fly blisters were placed on the chest and stomach, and her legs and arms were rubbed continuously. The doctors said that her kidneys, liver, bowels, and brain were congested. After twelve o'clock (noon) on Friday quinine was administered *per rectum* in doses of fifteen grains every three hours. Her stomach refused every thing with desperate nausea until the following Sunday afternoon. The quinine was given in enemas of milk and water, thin starch water, and beef tea, which also gave nourishment. In this way *one hundred and five* grains of quinine were given, when, on Saturday at noon, the physicians said that her pulse indicated that the quinine might be suspended. From the commencement of the attack until Sunday was passed (three days) she lay in a semi-unconscious state; intelligent when roused, but relapsing into quiet resting that was not sleep. The quinine was resumed in five-grain doses every three hours until twenty-five grains had been taken whenever there seemed to be any threatening of a return of the chill. She also has taken, ever since, a tonic, which gives five grains of quinine daily. On Sunday morning, the third day of the attack, she first became aware that she was blind. She was also *very deaf*, but the deafness passed away in a few days, as in other cases of deafness from quinine. On Monday evening she dimly discerned that there were five persons in her room, but only for a few moments. After this there was total "blankness" until the first week in September, when she dimly discovered a small spot of yellow on the window. After three or four weeks this assumed the form of a right angle, the outlines being lines of yellow light, apparently on a black background. And so from that time to the present the same process has been going on, more objects being outlined in lines of golden light, as on a black-board. She sees a circle of light, about a yard in diameter, when she looks at a lighted lamp or the sun, as if light were struggling to shine through a thick fog. She first saw only through the extreme outer corners of her eyes, and not at all in front. Gradually she has been discerning out-

lines in front. Now the objects seen on either side are dark, while those in front are still in the outlines of golden light.

Her eyes were examined by a competent physician on August 10th and 11th, and he pronounced her case one of "anæmia of the retina." He said that the retina was white, and the blood-vessels in it like white threads; that nothing but nutrition and new blood could remedy the trouble, and he hoped much from these.

Another ophthalmologist examined her eyes about the middle of October, and arrived at the same conclusion.

Present condition :

Right eye, vision $= \frac{7}{200}$.

Left eye, vision $= \frac{7}{100}$.

Ophthalmoscopic appearances : Disks perfectly white and arteries entirely obliterated and replaced by white lines ; the very few minute retinal vessels have white lines along their sides. There are a few white, fleecy-looking connective-tissue changes in the retina near the disk and a mottled appearance of the choroid. The pupils dilate downward and outward nearly symmetrically, and there are deposits on the anterior capsules of the lenses.

The patient was given a course of hypodermic injections of nitrate of strychnia, but without apparent benefit.

In both the above cases the blindness was evidently due either to the "congestive chill" or to the poisonous effects of the quinine. After reading most of what has been published upon the subject of late, I am decidedly of the opinion that they were genuine cases of "quinine amaurosis." Extended remarks upon the subject seem to be uncalled for. Dr. Knapp has gone into the whole subject rather exhaustively in an article printed in Vol. X of the *Archives of Ophthalmology*, and to this I beg to refer those who wish to know more about it. I may just add that cases have been published by Graefe, Wecker, Roosa, Voorhies, Michel, Gruening, Baldwin, and Baumgarten, all of which are referred to and analyzed in Knapp's paper.

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ANNOUNCEMENT.

The editors of this Journal regret to be obliged to announce its discontinuance after a satisfactory existence of five years. During this time the plan announced in the prospectus—of presenting to the reader only original material—has been persistently and, it is believed, successfully prosecuted. The suspension is rendered necessary, not from lack of support by contributors or subscribers, but through a combination of extraneous circumstances.

The editors wish hereby to express their grateful thanks to the collaborators whose work is embodied in the ten volumes of the ARCHIVES, to the profession which has so liberally supported it by subscriptions, and to the publishers for the care which they have bestowed upon the publication, and for their unvarying courtesy to the editorial staff.